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I never actually worked up on the hill at SSFL. I worked at the Van Owen facility and went up occasionally to the hill for visits. I worked with budgets, planning, project administration, acquisitions, and finally data processing.

I worked for Atomics International which was a division of North American Aviation. Projects that I was involved in included the Sodium Reactor Experiment, the Pyroprocessing Refabrication Experiment (PRE), and SNAP. I worked on another project for AI that was called Project Pluto – but that project was never up at SSFL to my knowledge. I handled the paperwork for all of those projects. I knew a fair amount about them. All of my work was documented in project reports. I do not know where those reports went once they were submitted.

I handled radioactive materials, but that was before my time at Atomics International. I worked for General Electric at Hanford, up in Washington State. I started there in 1951; I started with North American Aviation, Atomics International Division at the Van Owen facility on July 16, 1956. I never handled radioactive materials at SSFL. By 1955, handling radioactive materials was becoming routine. There was a way things were done and I doubt it was much different from what we did at Hanford. I am sure things were done the same way everywhere.

I also did not handle any chemicals in my position. I am not familiar with the location of where any radioactive or chemical materials were stored or disposed.

At SRE, things were by the book as long as they were working on the specified project objectives. However, they did not shut down once those project objectives had been completed. A project engineer who worked up there told me "things were getting pretty soggy in there." I interpreted that to mean that they were getting near the safety limits of the materials they were testing, but that is just my interpretation, I have no firsthand knowledge of that.

Things were quite different back in those days. Atomics International was a cost plus operation, and the amount of money the company made depended a lot on how good the relationship was with the client. Once the work that was supposed to be done had been completed, the AEC was interested in learning about the safety parameters. In other words, they wanted to know how much the design could be passed beyond the operational guidelines and still operate safely.

It was my impression that AI had been given verbal instructions (never written down) from the AEC to test the reactor to destruction. It was common in the aerospace industry to test to destruction – that meant you ran conservatively until you had met all the project objectives and then tested beyond that to determine the safety limits for the particular object being tested, and see how consistent the actual results were with what the modeling predicted. They were pushing the limits on purpose.

I am not aware of any other situations at SSFL that were similar or that had similar results. The PRE was developed to re-process spent reactor fuel into new (metallic) fuel elements. This was accomplished through metallurgical processes that were conducted using remote handling equipment in a hot cell rather than via wet-chemical processing of the kind we used at Hanford in the "purex" facility to extract plutonium. Hanford reactors used metallic fuel which we discharged after relatively short exposure to fission because the weapons program wanted plutonium-239 but didn't want other isotopes of plutonium which would gradually accumulate after longer exposures. Work at other sites (not at AI) revealed that metallic fuel elements swelled after fissioning for a long time, so that metallic fuel could not be used in power reactors. This discovery resulted in a decision to terminate the PRE project. Work at other sites (not at AI) subsequently developed oxide fuels.

We had a lot of exotic materials up at SSFL. The SNAP reactors at SSFL used beryllium reflectors. I don't know that they ever had any problems with that, but beryllium is pretty toxic stuff.

I am confused why they think the tritium that they are finding up there now could possibly be attributable to operations on the hill from the 1950s. Tritium has a very short half-life. Even if tritium was released from a reactor at SSFL, it would be long gone by now.

Frankly, I think the tritium is there because someone screwed up their measurements. Tritium is what I call a "soft beta" – it is not energetic. When I worked with it before coming to AI, I had to put tritium in a counter to detect it. You cannot detect tritium with a hand-held detector due to its classification as a "soft beta."

I have no knowledge of any spills or leaks.

In reference to the SRE accident, radioactive iodine could not have been released. Iodine reacts strongly with sodium, so if it were released, it would have bonded with the sodium and it would not have gone anywhere. I would believe it if there were some noble gases (krypton, xenon, etc.) released in that accident. They would not have chemically combined with anything so they would have been sure to escape. If they were released, they would have begun decaying immediately. Radioactive isotopes of those elements could, after escaping, have decayed to radioactive isotopes of halogens.

I have no knowledge of any chemical or radioactive materials being disposed on site.
I was trained to do my job mostly through on-the-job training. We learned as we went. Things were changing under our feet. Everything was done manually when I first started up there. Things changed rapidly though and things were beginning to be computerized.

People with clearances were working right next to people without clearances. I had a "Q" clearance. It carried over from my prior work at Hanford. The numbers that I was working with might have been considered classified. The only real use I found for my clearance level down here was when it helped me buy a car.

I do not know anything about policies for handling chemical or radiological materials. I was involved in monitoring project costs. I am not saying that there were not policies; I just do not know what the policies were. Everything that was done related to SSFL was documented. I do not know anything about any liquids being disposed of down any drains.

Beginning in 1951, I worked in the 100-B/D/DR/F reactor areas at Hanford. I was familiar with 100-H but didn't work there. 100-C was being built when I left. Reactor control was via horizontal control rods which could be moved in measured increments. Emergency shutdown ("scramming" a reactor) was via vertical control rods which were an all-or-nothing operation. When we shut a machine down, a decay chain that passed through a radioactive xenon isotope began to accumulate an inventory of that isotope, which had a very large neutron capture cross-section. If we didn't get back up before too much of that isotope had accumulated, we had to stay down for 12 hours or so, until that isotope had in its turn decayed away, after which we could start back up.

After an emergency "scram," which stressed components, (not after normal shutdown to re-fuel) we tended to experience random fuel element failures necessitating additional shutdowns. The galvanometer power level indicator measured in-core radiation. The integrating unit instead measured bulk coolant temperatures and flow. When we shut down to push fuel, or to clear out a tube which contained a failed fuel element, operators had to uncap the coolant pigtails for the selected tube(s) on both the front face and the rear face of the reactor. Refueling was strictly a batch operation with the reactor shut down. Increasing or decreasing production levels was done when the machine was up, by adjusting horizontal rod(s) position.

Hanford was a production facility. All the people who sat at the console were union people, paid by the hour. However, the operator, who was very interested in how much power the reactor was producing, wanted to maximize power production. Shutting the reactor down was something he was trying to avoid. Every once in a while a fuel element would get stuck in the pigtail. If that happened and it did not come out, we would have to shut the whole operation down. Well one operator in charge of the reactor figured out a way to handle it. He would take his film badge off, hand it to someone else, run to the back end, kick the pigtail and get the works flowing again, and then go back up and put his film badge back on. That kept the whole operation running. The B reactor was a production facility.

By contrast, AI was like a graduate school. SSFL had a completely different set of incentives. I experienced a bit of culture shock when I moved from Hanford to SSFL.

Unfortunately, at the end of the day, Atomics International's strategy was not successful. The consumers public power district (CPPD) sodium graphite reactor at Hallam, Nebraska was built, but failed after operating for a while. I don't think the decision to go with (untested) stainless steel cans for the graphite moderator was an attempt to reduce cost. I think they thought they were being conservative in going from an exotic material, zirconium, to a more conservative material, stainless steel.

Atomics International then built the Organic Moderator Reactor in Piqua, Ohio. The design had been tested up in Idaho. What worked under lab conditions failed a short time after it began operating. When they went to replace the reactor fuel, the oxygen atmosphere got to the coolant and turned it into a tar causing blockage of the coolant channels and the reactor was damaged. The designs worked on a small scale but not at production scale. They were trying to scale things up by a factor of 100 and that is not realistic . They did not want to hear that. They were too conceited. They didn't know what they didn't know. They had PhDs but they did not really understand how to scale up the idea. They knew the science, but not the engineering.

Many of the designs that they looked at were good designs, they operated at low pressure and did not require containment domes. We thought we were being innovative here – everyone else was using designs using water as the coolant. We were using sodium. Humans have thousands of years experience using water; we do not know that much about sodium or organic coolants. After the Three Mile Island accident happened, they had a hydrogen bubble as big as a boxcar, and it was under pressure, 100 times atmospheric pressure. That is a lot of hydrogen. The hydrogen was not caused by radiation. It came from the water. We knew they had a meltdown, although it was years before they admitted it. Atomics International sent them a hydrogen recombiner – an emergency shipment – to help them avoid having an explosion. The recombiner exposed the hydrogen bubble to oxygen using an oxidizer, which effectively turned a potentially explosive situation back into water. We knew the only way that could have been caused was by a meltdown. It took years for them to admit they had a meltdown.

As part of the SNAP program a critical assembly test facility was to be built at SSFL. A critical experiment is sort of a zero-power reactor used to measure reactivity. The SNAP reactors didn't use in-core control rods to control power levels but instead were reflector-controlled by varying the number of neutrons allowed to escape from the reactor versus the number of neutrons reflected back into the core. The reflector was beryllium metal. The designers, seeking perfection, didn't want their measurements compromised by having anything other than beryllium in the reflector. They requested beryllium bolts. Unfortunately, beryllium bolts were very hard to machine. When they estimated the cost for the experiment, the beryllium bolts would have cost more than the entire rest of the machine. The idea worked in principle, but it wasn't practical.

As a junior member of the unit doing chemical process engineering for the designers of the "purex" reprocessing facility, I was responsible for maintaining a very large schematic drawing which indicated all vessels and piping, etc., and listed quantities, temperatures, compositions, etc., for every vessel, pump, pipe, etc., and was responsible for heat and material balance calculations for the design project.

One of the listed properties was viscosity. That line was blank because the chemical research people hadn't yet suggested any viscosities. A staff assistant for the guy in charge of the plant asked to use my drawing in a meeting (to which I wasn't invited). He noticed the blank viscosities row, and said he didn't dare take it to the meeting with any lines blank. After a

certain amount of discussion I agreed to see what I could do, hit the books, fudged up some numbers, and filled in the row with one-significant-digit guesses.

I carefully erased those numbers when I got the vellum back. A year or so later, when I was on the road as a vendor inspector, while carrying out an inspection on large agitators at an automatic signal company division of Eastern Industries Incorporated, I was astonished to recognize my viscosities in the contract specifications.

I have no knowledge of the liquid materials being disposed of using toilets or floor drains; the sodium burn pit; the surface disposal area at the western edge of Area IV; any leach fields, septic tanks, or drainage discharge locations; the old conservation yard; any storage tanks, gas holdup tanks, etc.; nor any underground pumps, sumps, storage tanks, piping, sewer, or drainage systems.

I remember one time a guy wanted to develop new instrumentation to measure sodium flow. He needed a sodium tower so he could take advantage of gravity flow. He submitted a proposal requesting two kinds of funding, expense (wages, purchases, etc.) and capital (buildings, etc.). The expense portion was approved. The capital portion was rejected, leaving him with approval to proceed, but no facility to proceed in. He got a guy in facilities engineering to design him a tower made up of a small variety of standardized components, submitted purchase requisitions each just under the amount which would have been routed to me for review, personally hijacked a cement truck intended for another project on the hill, had PhD's out working with wrenches and trowels constructing his tower, and got the job done - which made him a hero within the technical community, but not to me. Once the new building had been built, an AEC guy saw it on a new aerial photo and said, “What’s this?” He obviously hadn’t approved the construction. The scientists were forever trying to figure out a way to work around the administrators. The sodium tower was located in the AEC Triangle.

I think that a lot of people are overreacting. There is not that much to worry about up there. I enjoyed working there. Altogether, I worked for Atomics International and the companies that bought it from 1956 through 1997. I retired on January 31, 1997. Three days after I retired, I went back to work as a contractor. I was a contractor until 2007. The Rocketdyne Division was sold to Pratt & Whitney in 2005. They had a two-year rule. No contractor could stay on longer than two years. Therefore, I finally had to stop working in 2007.

I liked working here a lot better than I liked Hanford. I went to Harvard Business School after working at Hanford, and I wanted to get away from weapons and into energy research. I was single when I lived in Richland, but it was a company town with plenty of rules. All the housing was controlled. Single people had to live in dormitories. Even the waitresses in the local restaurants had to have clearances. If you lost your job, you had to leave town because there was nowhere to live.

I moved here and I am glad I did. The culture here was a lot more relaxed.

Interviewee 31

I worked for Atomics International as an electronic tech from 1959 to 1960 at the SRE and SNAP reactors in Area IV. I measured radioactivity on samples used in reactor tests. These tests involved placing the rods in different positions to expose samples to varying levels of radiation. The position of the rods had an effect on the output of the reactor. Sample material consisted of various metals, approximately 3 to 4 inches in diameter, and enclosed by a resin casing. Beryllium was one of the sample materials I specifically recall handling. I was in charge of taking the irradiated samples to the laboratory, measuring the amount of radioactivity, recording the measurements, and returning the samples to the physicist in charge of the experiment.

A photo multiplier tube and a scaler were used to count the radiation given off by a sample. Data from the sample analyses were recorded on data sheets and maintained with the samples. Duplicate copies of these data sheets were not generated by me. I can't remember if I used a logbook and do not know where one might have been kept. It is possible that sample numbers were recorded in a log book, but I can't verify that information. I likely initialed or signed the data sheets following sample analyses. I measured samples from the SRE and SNAP reactors. The testing and measurement data would be used to make improvements to the reactor.

Once the samples were analyzed I would place the samples and their corresponding data sheets on a work bench shelf. The samples would sit on the shelf until a physicist working on the experiment picked them up. Sometimes I would have to remind the physicists to pick up samples left on the shelf for long periods of time. Samples were not thrown in the trash. The samples were either in the laboratory or with the physicist.

Sometimes a sample result would show more radiation than expected, but this was not considered an accident or incident, as it was part of the experimental process. Sample results that were outside the expected "norm" were further evaluated to determine if there had been an error or if the results were valid.

I wore a dosimeter, but no protective clothing. My dosimeter was taken once a week by a "safety person," presumably for monitoring, and was given back to me.

I received on-the-job training. They told me what they wanted and showed me how to use the equipment. There were not really any written policies for the work. One other electronic tech worked the same shift, but his duties were different than mine. There was not much oversight and I was left alone to do my job for the most part. The culture was such that the techs had a certain amount of camaraderie. During lunch or break time, we would talk, maybe have coffee, and sometimes watch the rocket engines firing.

The physicists talked about non-work a little, but most people were too busy to sit and gather for any long periods of time, except as it pertained to work. The work was standardized and there wasn't much variety in it, it wasn't that interesting or exotic. Everyone knew their jobs

and did them. People stayed in the area they worked in and would not be moving between buildings or walking around the site.

I had Q clearance in progress while working at the site, but left before it was finalized.

Samples needed to be kept clean for accurate results. Pure alcohol, as opposed to denatured alcohol, was used to clean any resins, dust, dirt, fingerprints, or other deposits off of the samples. Special signatures were required from a Ph.D. physicist in order to obtain the pure alcohol. I think it came in a one pint size bottle, but it would not have been more than one quart. I think I used Kimwipes to clean the samples with pure alcohol.

Used wipes and/or rags were placed in a trash can, but I don't know if it was a controlled waste container or special depository for waste wipes. The alcohol evaporated quickly and was only used in the lab in small quantities. I don't recall any waste alcohol that had to be disposed of. There were no written procedures for cleaning samples that were given to me.

I would examine samples under a magnifier to ensure they were sufficiently clean before taking measurements.

I am not aware of liquids being dumped down drains or toilets. I don't know why anyone would do that. The toilets were kept very clean and nothing went down the toilets that I'm aware of. I am not aware of any liquids going down any drains. I have no recollection of any problems with pumps, storage tanks, pipes, sewers, or drainage systems.

One of the smaller reactors, possibly called the SNAP reactor, was for the Germans. The work was being done through Atomics International, but it was for German reactor development.

Interviewee 34

I worked at SSFL from 1953 to 1987 as an engineer in the Facilities department and Purchasing department. Initially, I was involved in building test stands. Over my 34 years, mostly at SSFL, I was employed by various entities including, North American Aviation, Atomics International, Rocketdyne, Rockwell, and Boeing. I worked at Area IV from 1969/1970 to 1981/1982. After that time period, I still went up to the hill but my office was at the DeSoto facility.

I am a graduate engineer and was the 330th employee hired on at SSFL/Rocketdyne when I started in 1953. I was in Test, but I was not a button pusher. Everyone on the hill was in Test, but I was in a support organization, which later became Facilities Engineering. In 1956, I became the youngest supervisor in North American Aviation Corporation history at 24 years of age.

Between 1953 and 1958, I was on the hill. After that, my office was no longer on the hill, but I would still make trips up there. We built 17 test stands. When I started on the hill there were two test stands. We went from 2 to 19 test stands while I was involved. Atomics International didn't really have a presence on the hill until about 1956. I had nothing to do with AI. I didn't know much about them in my early years.

I spent a lot of time interacting at corporate offices from 1958 onward, when I was in Facilities and Purchasing, because we were building and growing. I had a lot of knowledge of the site history because I was involved for so long.

I have testified on Boeing's behalf in court regarding contamination issues three or four times since 1987, but not recently. The lawyers involved in those cases cautioned me that it was alright "not to remember things" if they incriminated Boeing. I understand that you would like me to remember everything for this interview to support the investigation and the final cleanup. I will do my best to be candid and forthcoming. All the press coverage now on the rocket and reactor side is stretched beyond the truth and a lot of the history isn't told. I have experience over the entire SSFL site, the whole 2,500 acres.

Even after I left the company in 1987, I worked for Facility Design firms that did work for Rocketdyne and Atomics International. So I stayed involved for another 10 or 12 years and made many other trips up to the hill, but not as an employee.

I have a lot of information on chemical contamination in Area I, II, and III. Maybe you could pass my name along to NASA as I am sure they could use this information when they move forward with their cleanup efforts. I also know about some contamination in Area IV and at DeSoto having to do with Atomics International.

We used certain chemicals, including trichloroethylene, in monstrous amounts. At that time there was no concern over its environmental impact because we didn't know how "dangerous" it was. We used hundreds of thousands of gallons of solvent in Area I, II, and III. Trichloroethylene was used in Area IV as well. Trichloroethylene was used to clean things. Other cleaning chemicals, such as toluenes and ketones, were used as well. We were experimenting with how clean we needed to be. Many solvents were used experimentally. Trichloroethylene (Trichlor or Trike as we called it) was used in huge quantities over the whole site because it proved to be the best cleaning chemical we used.

Liquid sodium explodes if you introduce water to it, but it dissipates. It is not, in my opinion, a contaminant. There are claims today that it is a contaminant if other things get in it, but I don't believe that.

As far as radiation, I had offices throughout Area IV starting in 1969. The Big Reactor was shut down by then. I was in the Facilities section of LMEC, which later became ETEC. I had full access to everything all the time. I don't use those words lightly. There was no place I couldn't go. I had the top clearance, above top secret, this was called Q clearance. I wasn't denied access anywhere. This also includes my time in Purchasing. They wanted engineers in the Purchasing department that knew what was going on so that, for example, when we ordered a certain grade of stainless steel we knew why it had to be so certain. There are lots of varieties of stainless steel. The engineers knew the exact type of material that was required for each job and that's why they wanted us in Purchasing. I was one of the first engineers in Purchasing for both Rocketdyne and AI. I later brought some engineers in with me as well.

I had little or nothing to do with the nuclear side of the business. When I first came in, there were no nuclear facilities left to be built. The nuclear facilities had already been constructed when I joined. We were building liquid sodium test facilities. Liquid sodium was dangerous, but not a contaminant.

The radiation hazards from 1969 on only existed in small laboratory areas because the Big Reactor was shut down. It has since been demolished and the site filled in. The test runs over the years, which I was not involved in, reportedly showed that there was some residual radiation, but DOE, AI, North American, and Boeing revealed the level of contamination. They weren't trying to hide anything. I think the contamination at the site has been overstated.

I was involved as the Principal Construction/Facilities Engineer at North American's facilities in Nevada. We built test stands there. In 1960, concerns were rising in areas of SSFL regarding potential hazards and noise and the effects they had on the adjacent communities. The noise hazard was exclusive to rocket testing in Areas I, II, and III. We built the facility 40 miles north of Reno because Boeing/North American didn't want to subject the Southern California community to any "more" hazards from SSFL. Pentaborane was awful stuff, but it was a superb rocket engine propellant. It was only tested on a very small scale in Area I at SSFL. It was tested more thoroughly near Reno because that facility was a "safer" testing

location; it didn't have people living nearby. Other "dangerous" propellants were also used there.

Many of the propellant chemicals did not get tested at SSFL because North American, Rockwell, Boeing, and NASA were always very concerned about hazards to the ground, community, and employees. But there are many things we did in the 1950s, 1960s, and 1970s that we did lawfully because there were no laws against them, such as using Trichlor. No one said we couldn't use it – it wasn't against any laws. Once it was made "illegal," they stopped using it. I used to wash my hands in Trichlor in the early years. We all did.

In 1971, when I went into Purchasing at SSFL Area IV, our office was in Building 30, which was 200 yards by air from the reactor, the big one that "over-reacted" and had the big incident. I was in charge of many things when I was in Purchasing, including packaging and warehousing, in AI. My Box Shop was in one of the buildings right next door to the reactor. We built crates, boxes, and shipping containers. I had a guy, ABC, who worked there full time for the entire time I was there. He lived to be 87. He had no history of radiation "poisoning." People in Simi Valley are concerned about being subjected to radiation and ABC worked right across from the reactor and never had any problems. I don't glow in the dark. I'm sure the radiation hazard was there. I'm sure there were people who had problems, mainly the guys and girls who worked down in the reactor itself before the incident happened in 1959. There are many things we did at Rocketdyne that, from a chemical hazard standpoint, were way worse than the radiation hazard. I mentioned pentaborane, a very hazardous chemical. We tested every chemical known to man in order to find the combination of oxidizers and fuels that would produce the greatest thrust (ISP).

Much experimentation was done in the early 1950s. That's when we were so concerned with cleanliness, and Trichlor was the best cleaner. We tested all sorts of solvents, including some that would "burn your toes off." Trichlor was a solvent we used when we worked with liquid oxygen because liquid oxygen (always the main oxidizer) would react with anything and things had to be exceptionally clean to prevent this from happening. Liquid oxygen was never used other than in "test-tube form" in Area IV. We did a lot of testing with liquid nitrogen in all areas where you needed extreme cold. But nitrogen is completely benign.

I mention liquid oxygen because in Areas I, II, and III not every test was successful. Many tests ended in explosions. We had a full time weather station at SSFL and had it for years and years. Explosions could have released clouds of hazardous chemicals that went over Area IV, but the fact that they went over Area IV hasn't been in the news and should not be a concern. But it may come up if someone is claiming that Rocketdyne contaminated Area IV. I don't think any of the explosions contaminated anything in Area IV.

As far as liquid sodium, there was an area called the Sodium Burn Pit in Area IV. I went by it many times over the years. That area was used to dispose of contaminated liquid sodium, so there are probably other "contaminants" in that area. So many things were used, there could be

over hundreds of different chemical contaminants. West of the Sodium Burn Pit there were other buildings where I think spills may have occurred.

There were 13 active water wells at SSFL over the years. The wells were used for everything but drinking. The water was not potable. Some of the wells were near Area IV. The water had too much calcium for it to be safe to drink. It came from deep in the crevasses of the rock and it has been "proven" many times that the water can't get out. Many of the contaminants that were used, kerosene for one, seeped down into the crevasses, but could not escape down into the valley because the crevasses were too tight. I think that has been proven by Boeing, North American, Rockwell, DOE, and NASA. As said, in some of these crevasses there was naturally occurring water, how it got there I don't know, but that's where we drilled the wells. Some of those wells have been sealed off and they may have "contamination." There were a few wells bordering Area IV.

I can identify the Big Reactor, Box Shop, Building 30 (where the Purchasing people were), a Warehouse, Clean/Unused Liquid Sodium Storage (storage was in barrels), Chem Lab, Machine Shop, and SPTF (Sodium Pump Test Facility) locations on the 1978 aerial photograph. There was a well just outside the aerial photograph's view. I would look at the Chem Lab for contamination. There could also be chemical contamination in a deep hole/pond near Buildings 40 and 59. The warehouse stored valves and parts like that, never any chemicals.

The Sodium Burn Pit stayed in the same place. We had other disposal areas in Area I and in Area II near CTL-3. We would get a lot of our chemicals in gaseous form. Once you finished what was in a gas cylinder bottle (called a K bottle) you couldn't just get rid of it and throw it away. We had a marksman from the police department/plant protection. He took his 30-06 and set up a K bottle 50 feet away and shot the valve off the K bottle to let the gas escape, but this has nothing to do with AI. The only disposal facility that I knew about at AI was the Sodium Burn Pit. I don't know exactly what they put in the Burn Pit because I was not responsible out there. I knew they disposed liquid sodium, but I don't know about any other chemicals poured into that pond.

The Area 1 disposal area could have had radium from instrument dials. Radium was then used to make instruments glow. I don't think there was any other radiation per se in this area. I don't think it had anything to do with AI, but I cannot say that as fact.

There were many things in the early 1950s that went on at SSFL that occurred before AI and the reactors were built. They did jet engine testing at the entrance to the facility. They brought jet engines up from the Los Angeles Division to test there. There was a "lot" of kerosene used. This had nothing to do with AI, but I wanted to make the point that a lot of things happened on the 2,500 acres of the entire SSFL site over the period 1947 to today that are not related to AI. AI was in a big corner that we "drove by" for years before LMEC. LMEC started in the mid-1960s.

I have the most experience at Rocketdyne in Areas I, II and III. We were pioneers, doing things that hadn't been done before. Some people probably thought that the people in AI are nuclear oriented and don't know what happened up here in 1947 or 1951, the early years. Although there wasn't a physical fence separating the areas, there was a technical separation between the rocket and nuclear side. There wasn't any technical interaction between the sides until the 1970s when some of us from the Rocketdyne side helped build test facilities for liquid sodium components. AI needed our experience from building rocket test facilities to help build the sodium test facilities. SPTF was a huge structure with a big derrick that we got from Peenemünde, Germany. That is when the relationship between Rocketdyne and AI warmed. A lot of guys came from Rocketdyne to AI with test experience that AI needed at the time. Many people at AI (in Area IV) were scientists and had little test experience. As engineers, we got our hands dirty. The scientists didn't. They did things at AI that we didn't need to know and we did things at Rocketdyne that they didn't need to know. There was technical separation between the two sides because of the work each side was doing. That is my opinion.

Our Maintenance people got into everything all the time. We worked very closely with them. We wore green and yellow hard hats, they wore green hard hats. All the different departments had different colored hard hats. They wore whatever they wanted at AI – they didn't have just one color. That illustrates one of the basic differences in the divisions.

We had a lot of camaraderie on the rocket side. We were "brothers of the spear." We all knew what could happen if things went wrong because of our years of experience. Safety definitely was part of the reason we had a lot of camaraderie. But there are many incidents, explosions, and things that happen that there was no track record for and once something bad happened then we knew we couldn't do that again. The scientists were nuclear scientists and they knew what made a nuclear reactor, but we on the rocket side didn't know about that. When I moved over to AI, they put a "velvet" rug down because I carried with me all my years of experience on the rocket side. They were grateful to have the experience of the rocket people that crossed over. In 1969, I was at the Downey Division working on shuttle facilities, but AI needed people with hands-on experience and they asked me and others to come up to Area IV at SSFL. The supervisors at AI knew of our test experience and they wanted it, so we crossed over into AI to help build the sodium test facilities. Eventually, the divisions merged and became Rocketdyne/AI, but I think the "schism" was still there. I call it a schism; you call it a cultural difference in the two sides. It was a technical schism in my mind, not a cultural difference.

The scientists at AI were doing small scale experiments, while we were doing mostly full scale work. When AI needed large scale structures for the sodium test facilities, they called on our experience with large scale structures. By the 1970s, we had built 19 test stands. They wanted to marry test experience with science. Initially, in the 1940s we knew nothing about rocket engines, but the Germans did, so we later brought the Germans over. This is what AI was doing, bringing in the people with the experience and knowledge they needed.

A lot of people at AI knew of explosions. We had a guy killed from an explosion in the Area I Research area and another guy lost his arm from an explosion, but those were the only two

serious incidents I can recall. The people in AI knew of the explosions and incidents and thought that Rocketdyne was unsafe. That's the reputation we had from AI's perception because of the "hidden fence" or schism between the rocket and nuclear sides. I had a friend who came from the AI culture and there was a technical schism between us, but we remained friends. We were learning as we went along, doing things that had never been done, even in the 1970s and 1980s.

I know very little about how radiological materials were handled in Area IV. I did wear a film badge when I went in certain places. Wearing the film badge was very strictly enforced. I had to show my badge, and often they would check my clearance before they would even let me in certain buildings.

I am not aware of any "off-normal" events that dealt with radiological materials. I don't know anything about the storage or disposal of radiological material. I knew radiological storage existed and that is was disposed, but I do not know anything specific.

Just about everything that came into Area IV went by the building I was in (Building 30). We could see trucks carrying barrels and cylinders coming into the site. There were a few buildings in the heart of the LMEC where the so-called "hazardous materials" were stored. They did little testing with hazardous chemicals. They tested valves and pumps that pumped liquid sodium. There were a couple of small buildings that stored the chemical gases, but I am not sure which buildings specifically.

The Sodium Burn Pit was used on a "daily" basis. I don't know if anything "off-normal" occurred at the Burn Pit. I had nothing to do with the Burn Pit per se. I knew where it was and I would sometimes hear the explosions when the sodium hit the water.

Company policies dictated how material was handled. We had a large Facilities Manual that dealt with that kind of stuff. People followed these policies. I don't think there were ever any intentionally unsafe practices. If we had a bad result from something we had never done before, then we knew that practice was unsafe. We were learning about and improving our knowledge on safety as we did tests. The policies and procedures evolved as we learned. The Facilities department included 130 engineers in my Design department and nine environmental engineers that reported to me. From 1980 to 1978, the nine environmental engineers were responsible for making sure that environmental hazards were monitored and controlled, such as disposal of chemicals. But by this time, there was no disposal of anything nuclear because the nuclear operations were shut down on the hill. There were some incidents in Building 103 at DeSoto, where there was a radiation lab doing some bench-type research. My nine environmental engineers were responsible across the entire site, Areas I, II, III and IV. They would disseminate any new rules in writing and ensure the people that needed to know received the information. There was wide dissemination in manual form.

I don't think anyone ever intentionally disregarded the procedures or rules to my knowledge. It would be sabotage or subversion if someone didn't follow the rules. We had accidents, but they didn't necessarily occur because a procedure was violated.

I don't know if any radiological or chemical material was ever left or disposed of in Area IV drainages. We had a big pond on the Rocketdyne side that residual kerosene would flow into in the 1950s and 1960s. We would sometimes burn it off at night, like they are doing in the Gulf now. When it would rain, there was nothing we could do and the kerosene would flow down South Canyon just south of Area III. A lot of chemicals left SSFL, but I don't know of any chemicals that left Area IV in quantity. There was a creek that flowed north of well 13. There were some chemicals I'm sure that left Area IV, but not in large quantities in my opinion. Although there are those who will say that's how Simi Valley became "contaminated."

Any incident, large or small, had to be documented. In the 1970s and 1980s, it was documented by my environmental people. Every test that was done was documented. I don't know where those records are or how they were kept. There were probably things that were not documented, but these would be routine things. Anything related to a test was documented. That's what we were there for, scientific history.

The Sodium Burn Pit was used pretty much all the time. I always felt it was used properly and with some level of guidance. There were always certain personnel involved and I saw them, they wore white uniforms and masks. They knew what they were doing, and what they were doing was not illegal. They were not doing anything at night, like when we used to burn off the kerosene from the pond in Area I and II. We knew we weren't supposed to burn off the kerosene and that is why we did it at night, but it was a better alternative than letting it flow down the hill in a rain storm.

I am not aware of any surface disposal area on the western edge of Area IV. There was a pond in Area IV (noted on aerial photograph) that you might want to look at. I don't know if it is still there. I recall a leach field (noted on aerial photograph) in Area IV.

There were conservation yards/junkyards in Areas I, II, and IV. The junkyards contained steel, pipe, and other parts that were cut up. Eventually, things were hauled off and sold. We would recycle things from the junkyard, if possible. When the tests stands were eventually torn down, a company came up and took the old steel. I wasn't there at the time, but I know about it.

I don't know of any liquid material being disposed down floor drains or toilets. We had toilets, but they went to septic tanks, we didn't have sewers. Maintenance people can tell you more about that than I can.

We sometimes had problems with our piping. We had a lot of "cross-country piping" in Area I where we transferred gases, (gaseous nitrogen and helium), water, and kerosene.

I look at my experience on the hill as one of the most wonderful experiences I could ever have as an engineer and as a person. To work up there for 34 years, doing things that had never been done before was something special for a lot of us. We didn't do anything that we knew was unsafe. Many incidents that occurred at Rocketdyne and AI occurred not because we were doing things that were unsafe, but because we were doing things that had never been done before.

Interviewee 57

I worked at the Santa Susana Field Laboratory from 1953 to 1956. I worked all over the site. It was a long time ago so it is hard to remember my experience there.

I did not work with any radiological material. I mostly worked with sodium. I worked with sodium, primarily in capsule form, in a glove box with remote handlers. The glove box had an inert atmosphere to allow us to work with the sodium safely. I felt pretty safe working in the glove box. I had to wear a protective apron and a dosimeter, but that was about it. I didn't have to wear any breathing protection.

When we were done with our work, we would throw old sodium capsules into the Burn Pit and let the sodium dissolve away. Anything that wasn't good was put in the Burn Pit. A guy worked up there and he would take care of stuff at the Burn Pit and make sure everything went as planned. He would help us out if we needed it.

I primarily worked with sodium, but I also worked with some associated cleaning chemicals. All the chemicals were stored in a location that was convenient for us to use. When we needed to dispose of anything, including the chemicals, it usually went to the Burn Pit. I do not recall any chemicals being dumped down the toilet or drain. I didn't see anyone dump any chemicals on the ground.

I received some training when I first started at the site. The lead men and other bosses would assign me jobs. They would tell me what they wanted done and how to do it.

We had rules and regulations that we had to follow. Sometimes the rules would change and I would have to read the new procedure to learn what had changed. Most everything happened as it was supposed to though and we followed the rules. Procedures were written down and we followed the procedures.

I also worked with asbestos. I would cut asbestos off of sodium tanks and piping.

I documented my work by filling out forms. I don't know how the forms were used or where they were stored after I turned them in to my boss. If anything went wrong it was noted in a report.

I was involved in an accident once on the hill, but I do not recall the details of it. My eye was burned by sodium and I had to go to the hospital for a while. On the way to the hospital, they flushed my eye with water to remove as much sodium as they could. It was painful, but my eye got better. A report was made to document the incident.

I heard about the "meltdown," but that was after I left the hill. I heard about it after the fact, but we didn't get involved in a lot of stuff that happened. It was a dangerous accident. Things

were classified and secret, so if we didn't need to know about something, we didn't know about it.

We probably did things we shouldn't have done, but we shouldn't condemn the company for that. It was not the company's fault. It was our fault. I don't remember anything happening that was the fault of the company. I have no regrets or bad feelings about the company. We tried to always do things by the rules, but when the rules changed sometimes we could no longer do things the way we used to. Sometimes we made mistakes or had accidents, but no one ever did anything wrong on purpose. We made sure everything was documented and we would correct any problems. In all the time I was on the hill, everything was done according to the rules.

I would look at the Burn Pit to make sure it is cleaned up.

I really enjoyed my job and liked working on the hill. We always had things to do. I was on the hill for three years and then I left to work for Rockwell at Canoga Park. I liked the people I worked with. The bosses were good guys and never did anything bad on purpose. I really want to stress that the company was not to blame for anything. If something went wrong, it was our fault and not the fault of the company.

Interviewee 58

I worked in a sodium building in 1978, it may have been called the Sodium Component Test Loop. We were running transient studies involving liquid sodium. Sodium melts at about 200°F. The sodium came in looking like Styrofoam. We would heat it up and pump it through various pipelines ranging from 1" to 12" in diameter. There were vertical and horizontal pumps. There were heaters along the lines. We would vary the temperatures from 250° to 1250° F. We would heat the pipes up, and then cool them down. The whole point was we were trying to see if we could break the line. It was a heat exchanger/heat transfer system. We were testing the pipelines to see if they could handle the changes in temperature. We were trying to see if we could break a pipeline, but we were not successful in that. I remember being told that they were running the tests to see if the pipes could be used in a breeder reactor. I don't know if that was correct, I don't honestly know. I am not an engineer. But that is what I was told.

Part of my job was to open the pipes to examine them. When we wanted to do that, we had to let them cool down so the sodium wouldn't be liquid any more. Then they would plug up the pipelines and I could open one up to examine the pipelines. Sometimes they would plug up a vertical pipe; sometimes it would be a horizontal pipe. If a pipe was still warm enough, the sodium would still flow down once the pipe was opened.

I don't know for sure what happened all the time, round the clock. I know what happened when I was on duty. I just worked one shift but the facility operated all the time.

One time they told me to cut one of the lines. They seemed to think the line was plugged up for some reason. I said it was a bad idea; that the pipeline was too warm and the sodium would flow out. They told me to do it anyway. They thought the pipeline was plugged up and that nothing bad would happen. I didn't want to lose my job, so I did what I was told. I cut the line, and liquid sodium started flowing out all over the place. A fire started immediately. We shut the pumps off, turned the heaters off, and used NAK to put the fire out. We called the fire department and they came. We had the fire out in about ten minutes. The engineers wouldn't even talk to me. I think they wouldn't talk to me because I had been right all along. We had to use NAK to clean the mess up. Once we got the mess cleaned up, it was back to business. That is the only time anything like that happened. It was frustrating to me because they didn't listen to me. We cut a horizontal pipe. The sodium was still liquid and a lot of it came out because the location of the cut was close to a vertical pipe and the liquid sodium flowed downhill. The only thing that went right was that I made the cut in the pipeline away from my body. This was smart because if I had cut it towards myself, I would have caught on fire. I told them it was a bad idea, they didn't listen, and I had to clean the mess up. They wouldn't talk to me after that happened. It was a frustrating experience. I think they were trying to see how I would react to the situation.

There was a pool of water outside the sodium facility. They used to throw things that were contaminated with liquid sodium in there. Then the water would blow up. The item that had been thrown in there would explode and burn.

I left my job on the hill shortly after that. My brother got sick. He lived in Las Vegas and I quit to go be nearer to him. Eventually, I went back and asked for my job back. They hired me back, but from then on I worked at the Canoga facility. I didn't work on the hill again. I was only up there a year, or maybe even less.

The only time I ever handled radioactive material was one time when we were told to go out and pick up some pieces of equipment that were on the ground. Then the Health Physicists figured out that the equipment was contaminated with radioactivity and they told us to stop what we were doing. I had only been picking up the equipment for about one-half an hour.

I know they had a glove box that they used to examine items that were radioactive. I saw it done once, but I didn't do that ever.

I didn't handle any hazardous chemicals. The only thing I ever did that seemed hazardous was when I cut the sodium piping. That was the only problem that I was ever aware of. Things really ran pretty smoothly up there. I did handle the NAK. I don't know if it is considered a hazardous chemical. It was disposed in a dumpster right outside the building. After the explosion, I just swept it up and then we threw it in the dumpster. It wasn't a normal dumpster. I used the dumpster that I was supposed to use. The dumpsters were easily accessible.

I don't remember any written procedures. As a general rule, people did what they were supposed to do. They had procedures down at Canoga, but I was not aware of procedures when I was on the hill. Our supervisors told us what to do and we did it.

I was a janitor before I started working in the sodium facility. The only training I ever got was on-the-job training. I didn't handle any waste.

I didn't submit any documentation for what I did. The engineers in the sodium facility probably documented what we did there. I think the supervisor was probably responsible for the paperwork.

I never saw any liquids disposed of down any drains or in any toilets.

The Sodium Burn Pit may be the place I already told you about. We didn't call it that back then. I don't know how it was used. It was there. I saw someone throw something in it once. It was like a show-and-tell. It was probably when I first started working in the sodium facility. It was a good thing for me to see that, it was a good experience, a learning experience. I was glad to know what I was up against in handling the liquid sodium. It was very easy stuff to handle and it was surprising how dangerous it could be.

The only incident I know about was the time I cut the pipelines. They thought the pipelines were plugged up. I was the last one hired and that's probably why they asked me to do it. I

told them I didn't want to do what they told me, but that I would if they told me to. I didn't want to get blamed if things went wrong.

I don't know anything about any surface disposal area or any leach fields. I don't recall anything about any conservation yard or junk yard. I didn't even know those things existed. I was a janitor for the first 90 days after I was hired, during my probationary time. They wanted to see if I was okay.

One day they asked me to go work in another sodium building. The working conditions were not as good in that building. I filled in for a guy who wasn't there, just one shift. I didn't like the place. My intuition wasn't good about the place. In my normal building, the layout was clean. I could see everything I needed to see. I was not interested in finding out what was going on in the other building.

I was a janitor before I went to the sodium facility. I swept the floor. I emptied the garbage in the dumpsters. I washed floors. I worked all over the hill. I did what a janitor would do anywhere else. Occasionally, I would have to sweep up these chips off the floor and put them in a big drum. When the drum would get full, someone would come pick it up and haul it away. I don't know where it went. No one else was around while I worked except security. There was this one guard who would sneak up and watch what I was doing. He seemed to want to catch me doing something wrong. He wouldn't talk to me. I was minding my own business, busy doing my job and suddenly, I would feel someone watching me. I was all alone, but there were bobcats and mountain lions up there. It would startle me. I told him I would take his gun from him and use it on him if he kept doing that. He stopped after that. I was only a janitor for 90 days.

They were good to me and I have no complaints. I have no concerns about the site.

We did not have any leaks in the sodium building. There were not any containment trays under the pipes, but there weren't any leaks. Our pipelines were very tight. I never saw any leaking or spills. NAK is like a fog. When we sprayed it to put out the fire in the building, I couldn't see anything. I called out to my partner. He didn't answer. It was scary. He was okay. I think he didn't respond because he didn't want to say anything. He knew they should have listened to me. I wasn't sure I was happy about having to breathe the NAK. I am in hospice now. My doctor asked me once if I knew what caused my emphysema or COPD. I smoked for 35 or 40 years. I don't know if the NAK could have made things worse. I was exposed to other things. I worked for a while plating parts. That was a really dangerous place to work.

I retired from Rocketdyne. They were good to me. They took care of me. It was a good company. I enjoyed working there.

Interviewee 78

I worked full time on the hill from 1976 to 1982 or 1983 for both Rocketdyne and Atomics International. There just was not that much difference between the two parts of the company, we just went back and forth. After I left SSFL, I went to Canoga Park as a purchasing representative and my duties took me back up on the hill occasionally in the 1990s and 2000s. I had an office in Canoga Park and then later on in West Hills. Later on, I was also involved in a laser and electro-optical program.

I was there during the years that DEF was the general manager, after GHI was in that capacity.

I left under my own gumption when I finally decided, "I need to get out of this mess." I knew that if I had to suit up and wear a respirator to work with radioactive materials, it was not going to be good for me in the long run. I wanted a safer job with less health risk, so I found myself a job in production controls and moved on.

I worked with radioactive materials, handling "a little bit of everything." I worked in decontamination, including the Sodium Reactor Experiment, the Sodium Burn Pit, and Buildings 5, 6, and 59. All the buildings had a yellow stack – which meant that radiological materials were handled there.

When I worked at the SRE, we took the facility apart. I was there for 1½ or 2 years, working 30 feet below ground surface and using a jackhammer. We would take a radiation reading and when we found contamination, we would dig it up, box it up in special lined boxed, and they would ship it away. I do not know where it was shipped to, but everything went off-site. I think it went to Beatty, Nevada. I do not know where it was stored on-site before it was shipped away.

We wore film badges. No one seemed to think it was that all that hot. We also used dosimeters and collected urine samples in a bottle every 30 days. This was all pretty standard health monitoring, and no one seemed to be too concerned.

A lot of things did not go as planned.

Building 5 had a coal gasification system that we ran around the clock. Coal was converted to a low butane gas by putting the coal in a vessel of molten salt. One day the molten salt vessel blew up. The vessel was under pressure and a 36-inch blind flange malfunctioned. Molten salt was spewing all over the place and going into the drainage system. Building 5 and Building 59 had both been contaminated from previous experiments. I asked, "how come we are not wearing film badges?" I was told that the buildings did not have that much radiation left in it and we would all be adequately protected as long as they were monitoring the building. So I asked for the radiation records, specifically for Building 59, and I was told they could not find them. When I pushed hard, they came up with some kind of calculation of their best guess as to what I had been exposed to.

A lot of stuff seemed to disappear like that.

I was working in Building 59 – which had the yellow and black stacks. I asked why we were not wearing film badges. I was told that they were not necessary because they were monitoring the building. The SNAP reactor was still in the vault in that building. JKL, the project manager, is dead. The shift manager, MNO, is dead. Another guy I worked with, PQR is dead. All cancer related deaths.

Going back to my story about Building 5, after the explosion following the flange blow out, nasty crap was coming out of there and running into the street in front of the building. We were putting sand bags out to keep it on the street. The stuff eventually froze up again. We got it shut down. I was one of the victims of that accident. I filed a workman's compensation case for hearing loss afterwards. I was wearing a respirator and a breathing apparatus – but no hearing protection. I went to an audiologist and found out I had tinnitus, damage to my hearing.

Working all those years with a jackhammer inside an enclosed vessel, and around the rocket testing, took a toll on my hearing.

I almost got killed once in Building 59. I was working on a rotating shift and they were in testing mode. There was a big pressure vessel in the other vault (not the one that the SNAP reactor was in). They had a big mock-up of the Clinch River fast breeder reactor that was planned for Tennessee. It was never built due to politics after the Three Mile Island accident. A previous test had been run and the meters were reading like all the pressure had been bled off as required. I was removing a blind flange from the vessel with a crane and soon learned there was still pressure in the vessel. It blew and sodium oxide was all over the place. I couldn't breathe and I couldn't see. I do not know how, but I got out of there. STU was there too. He died eventually of leukemia. It sounded like a nuclear bomb going off in that vault. There was not any radioactivity in there. But I do not know how I got out!

When I was working in Building 5, we would cut out components, like some piping for example, and take it over to the Sodium Burn Pit to burn off the sodium with a hose. We would stand behind a blast shield at the Sodium Burn Pit because you know what happens when you add water to sodium. That is what we would do. I do not know what that pit was used for before then. I have seen photos of buried objects in the Burn Pit, and I know contaminated valves full of sodium have been buried out there for years.

I was licensed to drive a skip loader. One time, I was operating the skip loader in the Sodium Burn Pit digging up asbestos from old tanks. I had to be suited up in protective clothing for this work. I ran into something that was solid and shiny – it was not a rock. I got a pug and got a reading on it; it was radioactive. It pegged the dosimeter. I reported into my supervisor and he told me to cover it back up and go away. We boxed up the asbestos I had already removed and I did what my supervisor told me and covered whatever it was back up and left.

Later, when I was a program representative for purchasing, I remember seeing a purchase order for some big tarps they would use to cover the place up before it rained. I have heard that a lot of things were buried out there and that everything went there back in the old days. The thinking was, out of sight, out of mind. I ran into one thing with that skip loader. I know from that experience at least one thing was in there that was not supposed to be. How many more things are in there?

We used trichloroethylene when I worked for Rocketdyne. We used that stuff all over the site, at CTL5, CTL6, and on the test stands, including Coca, Alfa, and Bravo.

One thing I found somewhat strange is that they do not have good records of who worked where. We were all part of this general pool with a common job classification. I was low man on the totem pole when I hired out there. Everyone else had 30 years of seniority – they could have all been my dad, I was all over the place, working here and there, wherever they told me to go. Then things got slow and I went over to Atomics International. That is when I started working in Building 59.

We used cleaning solvents for everything. Trichloroethylene was the most common, but we used other things, like Freon. We would flush things out in the open, and it would run down the asphalt, eating away at the asphalt as it drained. There were no catch basins. We used a line to flush with the solvents and the grease and oil would wash off. We did this outside of buildings. The tanks were already outside. We also used Dilenol (alcohol and water combination) in a closed, pressurized system.

Where did the solvents go after we used them? I do not know. Hopefully into a 55-gallon drum with some other miscellaneous solvents, but I do not really know. They were all stored in large vessels or tanks with pumps. Every building on site had trichloroethylene available. I have no idea where it was disposed.

Part of the problem was that no one knew how to properly dispose of solvents like we know today.

Did we have policies and procedures? Well yes – we pretty much did what we were told.

Rocketdyne was a lot more safety-conscious than Atomics International. They had a higher standard. The rocket side had a book of procedures on safety and everything else. The AI side was looser, it was more experimental. We did what our bosses told us to. Everyone at Rocketdyne followed the procedures. No one wanted to get hurt. One time I got a metal chip in my eye. They got me in to see an eye doctor right away and took care of it. They were always after us to wear safety glasses, hard hats, etc. The NASA folks, a lot of them had Air Force experience, and they were strict.

AI was completely different. They were looser and using different kinds of standards. DOE was not nearly as visible as NASA was.

The training we got up at SSFL was mostly on-the-job training. We did get some training in how to work with liquid oxygen and liquid nitrogen. I had been trained in how to handle those while I was in the Air Force. I was smart enough to know what not to do.

I do not know of anything buried at SSFL except for perhaps in the Sodium Burn Pit. I am not aware of any liquids being dumped on the ground.

As for record keeping, I have my own radiation records around here somewhere. I do have some questions about what I may have been exposed to while I was working in those buildings without a film badge. They claimed they monitored the buildings, not the people. They told me not to worry – they could come up with an estimate of what I had been exposed to. However, they do not know where I worked or at what time. They cannot seem to find any of their records. Maybe they do not want to find them.

That whole attitude did not set well with me, so I left and went on. Now I am starting to worry about it, especially when I started realizing how many of the people I worked with have already died. I wonder if anyone has ever done any analysis on mortality rates by buildings.

Could there have been any hot spots in Building 59? The SNAP reactor was in there until very recently. They kept it behind a locked door, but it was still in there. Building 59 is now gone. The same is true for Building 5.

On a daily basis, the shift leader filled out a log. The logbook kept records round the clock, each shift filling in what had happened in the building during their shift. Where are those logbooks now? I do not know. Maybe in the same place as the radiation records for the buildings that they cannot find.

My concerns at the Santa Susana Field Lab are with the Burn Pit, Building 59, and Building 5. Who knows what went into the Sodium Burn Pit over the years. The nuclear experiments that they ran up there ended long before I started working up there. It is possible that all kinds of things are buried there. It could have all been taken to the Burn Pit. No one seemed to think that was a problem, it's just the way things were done. Building 59 still had the reactor in it when I worked there. They buried it in place, but this still concerned me. Building 5 had previous radioactive experiments before I worked there and it too concerned me.

Would I want to build a house up? No.

If you buy a house anywhere near SSFL now, there are all kinds of disclaimers that you have to sign during your purchase of a property. Based on what I know, I would not even want to live in Simi Valley. I do not know what went on in the 1950s, 1960s, or early 1970s before I worked at the site, but I would be concerned living in the area. Many people have gotten sick

around there since the 1950s. At one time, there were 8,000 people working on the hill between AI and Rocketdyne. There were only 500 people employed up there by the time I was hired on.

I retired from Boeing. I think they are a good company. They are very safety conscious. They bought a real mess when they bought SSFL. They are not doing much now beyond cleanup. They are a good company and I do not think they would do anything sleazy. I feel sorry for them, getting stuck with that mess.

Interviewee 80

When I first started working at SSFL, there was nothing at Canoga or DeSoto yet. There was a facility (called Slauson) on Slauson Street in Los Angeles. Once the Canoga facility and the DeSoto facilities were built, they closed down the Slauson facility. I reported to the Slauson facility for the first two days I worked for the company, and then I went to Beverly Hills for a physical. I didn't start working up on the hill until Friday. My hire date was Monday June 13, 1955. There were no administrative services up on the hill at the time. In 1956, the Rocketdyne Division opened its own administrative services on the hill (Santa Susana).

When I started in 1955 there were no separate divisions within North American Aviation. It was one big company and the test site at Santa Susana was called the Propulsion Field Laboratory. In November of 1955, they divided the company into five divisions: 1) Autonetics, 2) Space, 3) Aircraft, 4) Atomics International, and 5) Rocketdyne. We became North American Rockwell when we merged with Rockwell International and then ultimately became Rockwell International. Subsequently we were sold to Boeing.

I worked for Rocketdyne from 1955 to 1992 and from 1996 to about 2004. I was in the Turbomachinery Development group at Santa Susana from 1955 to 1960. After 1960, I was based at Canoga but had management responsibility for one unit at SSFL. I was not up there full time after 1960. From 1955 to about 1958, I was located in the Area 1 engineering building which was a one-story wood-frame building on the road west toward CTL1. It was painted North American green, just like all the buildings up there. In 1958, my unit was moved to the engineering building in Area 2.

There was a Sodium Pump Facility just inside the front gate. They were learning how to pump liquid sodium.

I had only brief involvement with the atomic side of SSFL. There was a launch failure involving a rocket launched from Johnson Island, near Kwajalein Atoll in the South Pacific. The launch involved atomic warheads. It failed shortly after liftoff and the atomic warhead contaminated everything around it. They brought the engine back up to SSFL. Because the engine was one of my engines, I was asked to help see if we could figure out what went wrong.

My office was at the Canoga Park plant when the engine from the Johnson Island failure was brought up to the hill. I was managing turbomachinery engineering at the time and went to the hill specifically to look at the turbomachinery to see if I could detect any problems. I didn't find anything wrong with it. I think the Engine Systems people had already figured out what had gone wrong. We were just making certain that what they had not missed a problem in the turbomachinery. Based on what little experience I had up there when I was investigating the Johnson Island failure, I was under the impression that they were very cautious. I thought maybe they were being overly protective of me. I had to put on a white suit, booties, and gloves. I had a badge that you would pass in front of a Geiger counter to see if I had been

exposed to radiation. You would check the badge going in and coming out to see if you had been exposed. It is my recollection that they had strict rules about how long you could be in the areas.

I have no knowledge of how radiological materials were handled, stored, or disposed. In fact, I never even heard about the accident involving the reactor until years later. Everything that happened up at Santa Susana was classified. If you didn't have a need to know something you didn't have access to the information. The rocket engine people didn't know what was happening on the nuclear side and the nuclear people didn't have access to the rocket engine information for that matter. I probably wouldn't have found out about a nuclear accident in real time unless a health emergency was declared. If there were any concerns about unsafe conditions, the area would have been cordoned off. In the late 1980s a computer tomography machine, which was an inspection tool, was installed in the area previously used by Atomics International. I made a few trips up there to observe the construction and installation. There was never any atomic testing going on during this period.

VWX was the Facilities person I dealt with on this project. She provided the Facilities support in setting up the computer tomography machine in the late 1980s. She did a great job.

I was involved in testing turbopumps at CTL1, CTL2, Bravo, and Delta test stands. I was so busy with turbopump stuff, I didn't even know about the other rocket engine testing. There was a lot going on. The military was pushing us. They needed the IBMs and the ICBMs. We were right in the middle of the Cold War.

Regarding chemical materials, I worked with a lot of trichloroethylene. It was a great cleaning solvent and a great degreaser. It didn't have an environmental stigma at the time. I wasn't afraid of it because I had a job in a machine shop during high school where I cleaned machine parts with trichloroethylene using my bare hands. I've always felt the furor over trichloroethylene was overblown. I know it did a good job at just about everything, including taking the skin off your hands. Parts used in LOX systems had to be cleaned thoroughly to remove any hydrocarbons left by the fabrication processes and 'triclor' was the best cleaning agent available.

I really don't remember where we stored the stuff. I think it was stored in metal cans. I don't think it was stored in plastic containers. It may have been delivered to us in 55-gallon drums. I wasn't involved in transporting or storing it.

There were two groups on the hill: the development people and the test people. I was in Turbomachinery Development. The development people directed the test people regarding which tests to run. The test people then supplied the materials, operated the test stands, and did maintenance on the facilities. I wasn't involved in the management of chemicals. I wouldn't be surprised if someone just poured trichlor on the dirt when they finished cleaning something back in those days. It wasn't considered hazardous. It didn't even occur to me back then that we shouldn't do something like that. Maybe I lead a sheltered life.

I was aware of some off-normal events. I remember an accident investigation involving CTL-4 in the mid-60s. They were using UDMH and NTO as a propellant and a test stand blew up one morning. It killed a couple of guys. YZA was the chief engineer at the time and asked me to be his representative on the hill during the investigation.

I remember another incident that occurred at Delta 3 one night. They were testing fluorine, which is a great oxidizer but a miserable chemical to handle. You got more for your buck with it than with liquid oxygen. A fluorine leak occurred somewhere in the piping system. I was testing turbopumps at Delta 2 on second shift. Fluorine has a strong odor (they put fluorine in public water systems to help your teeth, but its smells bad). At any rate, I remember the Test manager, BCD, came roaring over in a jeep and told everyone to get out. To my knowledge, no one ever had any ill effects from that event. I don't remember what they did with the fluorine. They probably drained the tanks. I don't know where they drained the fluorine to, to the ground maybe or they could have brought in hazardous handling rigs, but I don't think so. I don't think they existed at the time.

There is a difference between getting a strong smell and suffering ill effects from it. For example, when I was a kid, my father's machine shop was in an ice plant that used ammonia as the refrigerant. That building was built in 1900. It was an old place that had lots of leaks. We smelled ammonia all the time and had no ill effects.

Kerosene, oxygen, and nitrogen were the highest consumption liquid materials used that I worked with at Santa Susana. Nitrogen was an inert gas used to pressurize tanks, but is not hazardous.

I do remember we had these big water cooled flame buckets that deflected the rocket flames away from the ground. The engine exhaust produced a lot of soot which flowed downstream with the flame bucket water. The soot from the Alpha and Bravo areas flowed into ponds. There were fish in the ponds but they weren't very appealing because they were all black from the soot. We didn't consider the soot to be toxic.

I didn't need (or get) a lot of training. We were all learning as we went along. Most of the training we did get was safety training for the test stands. Each test area had a system of lights. Red meant a test was underway, yellow meant a test was about to begin. Green meant you could enter. I didn't have any materials handling training because I wasn't doing that type of work.

They had a liquid oxygen plant up there for several years. It was between Area I and Area II. So we had our own, local source of liquid oxygen. Kerosene came up in tank trucks. We handled similar to the way gasoline is handled at a gas station. It didn't require anything special.

There were very few liquid oxygen accidents. One happened at Bravo 2 on a day with very low humidity. A layer of the liquid oxygen was floating as vapor close to the ground. It wasn't

visible – it looked just like air. A guy came out with a cigarette and threw his cigarette butt on the ground. When it hit the liquid oxygen layer, the asphalt flared up. When he stepped on it to put out the fire it flared around his shoe. I heard the story, I didn't see it. The mechanic lost a pair of shoes but wasn't hurt and but there was no environmental damage.

There were company policies. There were a hundred rules and regulations. These were more focused on airplane plants than on rocket plants testing. It was against the rules to sleep in the airplanes. This didn't have much bearing on us in the rocket side, but because we were part of North American Aviation, it was one of the rules. They could fire you if you racked up too many violations. A lot of the rules were more focused on what we weren't allowed to do. They didn't allow tardiness or insubordination. The rules were mostly related to personnel issues and didn't guide how we were supposed to do our work.

We documented a lot of our activities. We recorded what we did in logbooks. We generated a lot of reports. Later, briefing charts replaced reports. The briefing reports went to the government, our customer. The government was paying for everything we did and each program had its own special requirements for reporting. They reports and briefing charts were kept in files in the program office. We also had to do progress reports and monthly reports. A lot of the files got trashed after we moved them around too many times. I kept my own reports in my file cabinet through about 1965. Almost everything was classified up to about 1965. I had a secret clearance, but I still didn't see everything. Files were organized by department. We saw things on a need-to-know basis. When I was in the Army, I was in the security division.

I was involved in developing turbopumps for the rocket engines. I worked on the Navajo, Jupiter, Thor, Atlas, H1, and Shuttle rocket engines.

The impression I had was that they were very careful with the nuclear stuff. The nuclear stuff was not very forgiving. There was a heavy emphasis on safety. They were conscious that they could hurt people and they didn't want that to happen. On the rocket side, we needed hardhats to go to a test stand. They were not designed for people as tall as me; I am 6 foot 4 inches. We always documented what we did. In all of my years, Rocketdyne was a very open technical organization. There was very little political maneuvering. We could argue on a technical level, but that didn't carry over to the personal level. We got along like a team.

One of the wonderful things about working at the place is that we were all looking for the truth. We didn't want to do something wrong; it didn't make any sense to proceed with a test if we were going to do something wrong. We were interested in learning together. It was a fun place to work.

Trichloroethylene was no big deal. It was like how cocaine used to be in Coca Cola and doctors used to prescribe it; they thought it was good for you. We didn't know what was bad for us. We weren't afraid of it.

They worked more with chemicals in the research area. They developed solid propellants for armament rockets like NASTY, NAKA, and NALAR. The NA part always stood for North American. I don't know what the rest of the letters stood for. The solid propellant rockets had fins on the back to spin-stabilize the rocket. They had an explosive war head on the end.

I have a book about Rocketdyne, written by Robert S. Kraemer in 2006. It's called Rocketdyne: Powering Humans into Space. It provides a lot of the history.

I am not familiar with the Area 4 Sodium Burn Pit. I do know that sodium burns when it comes into contact with oxygen. It would seem like that may have been a place to get rid of sodium. I don't know what the result of that would be. I don't recall hearing about a surface disposal area. I would have probably heard about that if it existed.

I was told there was an area west of the old Area 1 engineering building where old rocket engine parts were used as fill. (Some of the old engines had gold in them. We had a lot of failures over the years; we blew up a lot of hardware. The engine parts became junk once they failed. It wouldn't have paid to have them hauled off. There was a long old building that was used as an equipment lab on the left side of the road and the engineering building on the right side. Just past the engineering building, there used to be a canyon that isn't there anymore and I was told they used scrap rocket engine parts to fill it in.

Most of the test stands have been taken down. If we had a propellant tank, before we scrapped it out, I am sure we would have cleaned it out first.

Once we had a contract to build two tanks, one each for NTO and for UDMH for the upper stage engines on the USAF Manned Orbiting Laboratory (MOL) program. They were designed with bladders to be squeezed. The pressure outside the bladder pushed the propellants in the bladder into the engine. They were built at Canoga Park but I don't remember if they were ever tested at SSFL. If they were it was before I came on the program and the tests would have been conducted in Area 4. But nothing was ever thrown into the scrap heap until it was decontaminated first.

In my experience, Rocketdyne was always very careful. I have to believe that Atomics International was the same way. It was a culture that came down from North American Aviation.

I don't recall any problems with any tanks, where the tank itself was a problem... Most facility tanks had to be designed with a 10 to 1 safety factor. Flight weight tanks were lighter than what we had on the hill. They rely on the pressure provided by the propellants for structural integrity. They only had to last until they were emptied. We never tested any flight weight tanks up there. Our facility tanks were very beefy.

I loved working up there. I can't think of anything that would have been more interesting to me. The government wanted these ballistic missiles. The public wanted us to be successful.

The engine testing would rattle the valley. They knew it would help keep the Russians from bombing us. Now, they are not doing any more rocket testing here.

During the Cold War, the government wanted missiles bad. The contracts were cost plus. We didn't worry too much about costs. There were incentives for us to build lots of test stands. In 1958 or 1959, there were 18 large engine test stands. They were firing all the time. It was a phenomenal time that will never be repeated.

I retired in 1992. I was out for about three years, and they asked me to come back. Boeing was developing a "flex force." There were not any benefits except you could add to your pension. I worked on the RX68 engine – a gas generator cycle engine they were planning to use on the next moon mission.

I was a nuts and bolts guy. The one thing I missed the most once I retired was the interface with the people. EFG was the president of the company when I hired in. He was much loved by everyone. Everyone felt he was looking out for them, personally.

I remember the DC electrical generator for CTL-1 came out of a Pacific Electric substation. The Pacific Electric streetcars were the early rapid transit system in Southern California. The valley line ended at Shoup and Victory. There were double tracks running down Sherman Way. It was a magnificent system at one time. I rode it to school during junior high and senior high school.

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I worked for Atomics International at Canoga Park, California from 1961 to 1973 as an engineer with the SNAP 2, SNAP 10/10A, S8ER, and STIR programs. Prior to my time at Canoga Park, I worked on the OMRE, SPERT, MTR, and SL-1 for Atomics International in Idaho Falls (1957-1961) and for General Electric in Hanford, Washington (1951-1957). I provided a brief chronology of my work history to the interview team. (I also showed the interview team a scram button that was removed during decommissioning of the STIR facility, a pneumatic tube for collecting samples, and my QA stamp, which was the first neutron radiography level 3 stamp ever produced.)

I worked on SNAP 2 and SNAP 10/10A in Building 24. The SNAP 10A program became SNAPSHOT, the first nuclear reactor in space. I was involved in calibrating the reactor instrumentation. The SNAPSHOT program ran for less than 30 days as the DOD collected all the information they wanted from the program and then shut it down. SNAPSHOT has a 300-year orbit and is still in space.

I worked on the S8ER in Building 10, which was much larger than the SNAP 10/10A reactors. But after 2 years, the S8ER was shut down. I was an alternate engineer in the Building 12 critical facility, where all of the free plutonium in the world was located at one point.

Most of my work at Canoga Park involved the Shield Test Facility and Shield Test and Irradiation Reactor (STIR) in Building 28. The Shield Test reactor was a 50 KW reactor. It was shut down and converted to a 1 MW reactor, which became the STIR. The STIR was used to conduct irradiation tests for the Jet Propulsion Laboratory. Samples for this testing were handled quickly as the half- life of isotopes involved was just minutes. Under the STIR program, I conducted studies on shielding, neutron activation, and neutron radiography. Neutron radiography was my primary research in the early 1970s. I worked on neutron radiography of electronic explosive devices for the Saturn and Apollo space programs, including Apollo 7 through Apollo 17. An issue of the North American Rockwell Corporation journal *Skyline* shows examples of how neutron radiography can be used in non-destructive examination. The radiograph of a motorcycle was my son's motorcycle. The radiography left the motorcycle slightly irradiated and an AI health physicist noted I could not take the motorcycle home right away.

I was also involved in non-destructive ultrasonic and radiographic testing of reactor vessels. I was part of a team that built a skate to move around the pressure vessel of a reactor and electronically transmit information back to the engineers. This system was developed at Santa Susana and then applied to the testing of railroad cars in Louisiana.

In 1973, I was part of a team that went to Sandia National Laboratories in Albuquerque, New Mexico to conduct studies on weaponry, such as the thermonuclear B61 (Mk-61) Bomb. We were known as "black hatters" (bad guys that steal weapons) and our goal was to determine how dismantled weaponry could be reactivated. The lab had three dismantled nuclear devices

that we worked on reactivating. We had some assistance in our efforts in the form of the operator's manual for the weaponry.

The only incident I am aware of during my time at Santa Susana is the use of approximately two parts per million of potassium dichromate in the STIR cooling tower. Potassium dichromate was used to minimize corrosion, but the state of California came in as the regulator and stated it could no longer be used. A phosphate compound was used to replace the dichromate compound.

In the late 1960s, AI underwent a big layoff period. When I was first at the site, there were approximately 300 employees, but by the time I left there were approximately 60 people. It seemed that every Friday we were having a going away party. A reduction in forces occurred at other labs as well, including Argonne National Laboratory and Oak Ridge National Laboratory.

I wrote the safety analysis report and worked on the engineering of fuel element removal and shipment from the STIR facility. When fuel elements had to be replaced, the used fuel elements were placed in a storage rack inside the reactor vessel. New, unused fuel elements were taken from the storage vault in the building and placed in the reactor.

STIR was owned by AEC (now DOE) and used for neutron radiography. When General Electric built its own neutron radiography facility, AI decided not to compete with them and abandon the STIR for the L-88 reactor. The L-88 reactor was also used for neutron radiography and was the first reactor of its kind.

Documentation from experiments and testing, including rolls from recorders, were packaged quarterly and sent to Rockwell International storage facilities that were originally in downtown Los Angeles, and moved later to Newport Beach. The Newport Beach facility also contained documents from the Nixon library. Nearly 10 years of records from the STIR facility would have been sent to one of these locations.

In the late 1960s, I recall one day at the STIR facility when we were told to "shut her down" because of what was interpreted as being air emissions from the building stack. We never asked questions when told to shut down a reactor, so we did what we were told to do. However, the instrumentation and records on the facility were all normal. The readings that had set off the alarms were consistent with a bomb, not with normal operations of the reactor. About a half hour later, it was discovered that the Chinese had detonated a nuclear weapon and fallout in the atmosphere had been mistakenly attributed to the STIR facility. Weapons testing fallout was not a big deal to us, but this instance got our attention because we had to shut down the STIR as a result.

We had a "safety first" attitude throughout AI and this dictated how operations were conducted.

I never went to the sodium pond, but I am aware of a pond in the western portion of Area IV used by AI and Rocketdyne to dump excess sodium or NaK used in the S8ER. It would snap,

crackle, and pop like fireworks when exposed to water. When SNAP piping was steam cleaned, you could also hear the snap, crackle, and pop in the piping due to the sodium and water reaction.

Water from the STIR cooling tower would drain into a holding reservoir at the edge of the asphalt driveway leading into Building 28. The reservoir would accumulate cooling tower water as well as rainwater. A sump pump located at the northwest corner of the test vault accessway was used to pump the water over to Rocketdyne. After the water was pumped to Rocketdyne, AI had no control over it. Rocketdyne conducted regular sampling of the water and then released it to the Los Angeles River. AI was essentially a guest of Rocketdyne's at the site and Rocketdyne could tell AI what to do. Presumably, if there were any issues with the water from AI, Rocketdyne would have discussed it with AI.

During a shielding study test, the intensity of the radiation was so great that a temporary perimeter, similar to the caution tape used by police, had to be established outside the regular building perimeter.

My last chore at AI was packaging up and shipping lithium hydride and tungsten slabs to Oak Ridge National Laboratory as part of an AEC consolidation effort. The slabs were approximately 8 square feet in size and ranged from 1 inch to 10 inches thick. They were used in shielding studies related to a project that aimed to send a person and reactor into space together. The AEC began centralizing operations and eliminating duplication. This involved moving operations to Oak Ridge, which had a reactor the same size as STIR.

Radiological material was handled very carefully. I was trained in both neutron radiography and explosive devices for my work at AI. The NRC developed "tech specs" for handling radiological material. These specifications were very comprehensive and almost made it difficult to build a nuclear power plant as some of the specifications were difficult to achieve. Work became more laborious after the tech specs were developed. Prior to the NRC tech specs we had operating limits that we had to work under. The operating limits provided more room to operate than the tech specs and allowed common sense to dictate how operations were conducted. (I provided the interview team with a document describing STIR operating limits.) But after Three Mile Island, the NRC developed the tech specs, which became the way of living for nuclear power plants.

There were no real reactor incidents during my work at AI. If reactor instrumentation showed unusual results we would scram the reactor and operate in safe mode. Procedures dictated that an incident report would have to be written up. The incident report would be distributed throughout the organization and used as a "lessons learned" tool. An outside team from DeSoto would come to critique operations and review the incident report to prevent similar incidents from occurring in the future and ensure issues are handled the same way across the site. The incident procedures demonstrate the attitude regarding safety at the site.

I received a lifetime exposure of 24 rems during my time at Hanford, WA, Idaho Nuclear Laboratory, and SSFL. Most of my SSFL exposure was from neutron radiography using indium plates that were 16 inches by 20 inches by 1/16 inch thick. The plates would become activated and because of how we held the plates, I received facial exposure. I wore safety glasses and a dosimeter that kept daily records of my exposure. During shielding studies, the reactor room would sometimes become so hot we had to wait a few months for the radiation to subside so that acceptable exposure limits were met. This happened several times, but as a result, we never had any abnormal exposures. Objects used for shielding studies were 5 feet square of various thicknesses. Materials studied included lithium hydride, depleted uranium, lead, and tungsten

Radiological waste, including contaminated clothing, was disposed at the RMDU in 55-gallon drums. Initially, these drums were taken out to sea and dumped, but that practice fell out of favor and after than all waste from the RMDU was sent to Idaho for disposal. I am not aware of any Area IV waste disposal on site. When projects were shut down, uranium and plutonium were transported to Idaho for disposal. Beatty, Nevada was also considered as a disposal location.

The only hazardous chemical I recall working with at AI is lithium hydride, but it was encapsulated in aluminum and was pretty safe unless the lithium hydride was penetrated.

The Organic Moderated Reactor Experiment (OMRE) in Idaho Falls was an organic reactor that was cooled with an organic terphenyl. A by-product of this was byphenyl to which we were all exposed. Additionally, when we had organic spills, such as a spill on the floor, we would clean it up using trichloroethylene. These organics exposures were considered normal before we knew the materials were hazardous. I do know that UCLA did a safety study as a result of our exposure, but I never heard the final results.

Also, regarding hazards, I recall when I worked at the 100KE reactor at Hanford, I was associated with a technical group that performed coolant studies in a facility called the 1706 KE. The tests included high temperature coolant operations, which called for use of asbestos as an insulation material. We had a contractor that was good at his work, but sloppy in his cleanup, consequently we had lots of loose, airborne asbestos all over the place. This went on for two years at which time I left GE Hanford, and I went to work at Rockwell Idaho.

Lab activities at AI used radiological sources and chemicals handled under a hood. Radioisotopes for calibration units were stored in the floor vault and when the STIR facility was decommissioned the calibration sources were sent to DeSoto, but I am not sure how they were ultimately disposed.

I was trained by ordnance people at the Downey facility to conduct neutron radiography on ordnance devices. I received radiological training by peers at AI. I also received hoisting and rigging training from an outside contractor. The people in the AI training department were sticklers for training.

As I recall, everything I did at the SSFL was documented. We had sheets documenting start-up and shut-down procedures and kept log books documenting work. All documentation was retained at the storage facility in Los Angeles or Newport Beach.

I think the sodium burn pit is the same sodium pond I referred to earlier where excess sodium and NaK was sent for disposal. I am not familiar with the service disposal area or any leach field or septic systems. I am not aware of liquid material being disposed down floor drains. I don't recall any issues with drainage systems or tanks other than two Rocketdyne guys that were killed when they entered an underground vessel that contained nitrogen gas. The Old Conservation Yard was a junkyard where lumber was deposited. One employee took lumber from the yard to build a house on the Colorado River in Nevada. People could bid on items in the junkyard in an auction.

Interviewee 125

I worked for Atomics International from 1962 to 1965 in the Building 20 hot cell, and the DeSoto facility. I also did some hot cell work in the SRE cleanup, removing some fuel rods.

I handled radioactive material all the time in the hot cell.

I was young when I started and didn't know what I was doing on my first day. There was a pretty rapid learning curve, but I was impressed with the operations of Atomics International. I was impressed from one end of the facility to the other and thought operations were very well thought out and facilitated. The key was safety in handling radioactive material. I was quickly indoctrinated into the hazards of what I was working with. I had some basic knowledge, but I did not come to my job with all the necessary knowledge. I think we had a unique operation in the hot cell. There was the potential for bad exposures if something went wrong. But I thought the design of the building was well thought out and engineered with safety in mind. Safety was pretty much the number one concern and everyone I knew took safety very seriously.

Anything that occurred that was not planned was very minimal. From my experience any non-planned events were easily handled and rectified. There was constant monitoring, and the health physicists (HPs) in our building were constantly monitoring everything, including keeping track of our doses, and various areas of the buildings. The building contained separate areas that required different safety protocols and levels of personal protection. Areas were temporarily marked off with ribbons or tape occasionally so you knew not to go into a certain area unless you had the proper protection. Even if a temporary area had to be set up, it would have been well marked with tape or roped off. When you crossed into a certain area you had to abide by its dosage rates, cleaning standards, or protective clothing requirements. It might have seemed like they were going overboard now and then if you didn't know what they were dealing with. They took it seriously.

I am all for the company. I had a positive experience at Atomics International. My wife worked for Rocketdyne for 27 years and my daughter has about 27 years with Rocketdyne as well. My family has had a very positive experience with AI and Rocketdyne.

I know there may have been things that weren't done correctly, but part of that is probably a lack of knowledge at the time. As science progressed we were better able to predict outcomes and hazards. I feel Atomics International was very responsible and encouraging toward safety. I can't fault them for anything.

I did live in Simi Valley for a while and I do know what is going on in the community. I think some members of the community are what I call "Green Weenies." I thoroughly believe in environmental protection, but I also believe in common sense. There are people that go overboard and they go overboard without the proper knowledge of the situation.

I would definitely disclose any information I had on potential contamination if I had it, but I just don't have any knowledge of this.

I was interested in the SSFL community activities as a citizen of the area, and as an employee of the Ventura County Fire Department. I was even involved in some local politics and I know what the people have been saying for many years. Honestly, I am surprised this is still going on. The site was cleaned up and I thought that would be the end of the community frustrations, but even that did not satisfy everyone. I don't know what is still up on the hill today.

I took my work and the hazards associated with it very seriously. I knew the risks and we took the appropriate precautions. I don't see with the knowledge we had at the time, and probably even now, how they could have done a better job. We had certain jobs to do and there was a small percentage of risk associated with those jobs, but you assumed that risk with the job.

I was in the Air Force as a jet mechanic and I took my job very seriously because I knew that other people's lives depended on me doing my job properly. I had that same mentality working for Atomics International. Sometimes things didn't go exactly as planned, but if there was a potential exposure it would have been seconds, maybe minutes, but you knew what the exposure would be and you had a dosimeter, a film badge, and a hand meter. In some cases, a health physicist may be right there behind you with his own meter. I felt very well covered and secure with regard to health and safety monitoring.

We dissected the fuels that came out of the reactors in the hot cell and would run tests on them. We would take the fuel out of its casing, cut it apart, and take various measurements as our work dictated. I also worked in fabricating the fuel down at the DeSoto facility. I worked at two buildings in DeSoto. I am not completely sure of the numbers, but I think I worked in Building 1, the main building facing DeSoto Avenue, and another building behind Building 1.

I didn't machine any fuel at DeSoto, but we would pick up fuel from the machine shop. I think the machine shop handled beryllium. Safety rules dictated that we report any movement of fuel from building to building. We had to have movement of fuel authorized and they had to keep track of how much fuel was in any one location to prevent potential danger. We knew we couldn't have more than a specified amount of fuel in any particular location at a time. We would have to make a phone call to get permission to move the fuel. I assume they checked the load in the area and then told us whether we could move the fuel.

Handling the fuel from the machine shop at that stage was not particularly hazardous. You had to wear gloves and prevent contact with the skin. Sometimes you would have the fuel installed in an air-controlled atmosphere. Although I didn't machine the fuel at DeSoto, I weighed and measured it. I can't remember for sure if we cleaned the fuel when we got it or when we finished working with it, probably when we finished working with it, but I am not positive. In retrospect, I think the cleaning process was the only part that could have been done better. We used trichloroethylene, a cleaning solvent used throughout industry. Current knowledge tells us that this wasn't the best chemical for the environment. But we were using the chemical in a

little glove box, not in any huge machine. At DeSoto, we were just one line in the fuel machining and fabricating process. We ran tests and collected measurements on the fuel which had been cut into various lengths before we received it. This was done to collect baseline data for comparison with fuel that came out of a reactor after use. There were records associated with each fuel rod and they were numbered on the end. We would take measurements on each segment of the fuel that would later be assembled to form the fuel rods.

The only time I ever had a problem that scared me I was working at DeSoto. We were putting fuel into the cladding and then a welder was going to seal the fuel in the cladding. We had to load the fuel inside a controlled atmosphere. I think it was a nitrogen atmosphere. We had to purge the atmosphere, get it under a vacuum, purge again, and then fill it with nitrogen gas. Once the fuel was loaded into the cladding, we filled the cladding with NaK and/or sodium and then the cladding could be sealed by the welder. The glove box I worked in had an access port that was also atmospherically controlled. Under an inert atmosphere, we would clean the glove box out. I think we did a dry clean of the glove box first, and then used acetone and damp Kim wipes for the final clean I think. I was at the last step of the process and loaded the damp Kim wipes into the glove box. I went to stick my hands in the glove box when a big explosion occurred.

The explosion occurred because there was still a speck of sodium or NaK in the glove box and it reacted with the moisture from the Kim wipe. There was also acetone vapor in the atmosphere and once that flashed it caused a big explosion. I was very lucky in that I had not closed the access port so the explosive gases had a place to vent. It looked like a rocket engine with flames shooting out of the access port. That is the only major incident that happened to me, but I wasn't exposed to any radiation. The use of acetone may have been the biggest safety factor involved in that incident, but not being a chemist, I wouldn't know what other chemical was available to do the same type of job.

I cannot think of any similar large incident that occurred at SSFL. There were probably a lot of little things that occurred at SSFL that were unusual, but nothing that wasn't at least anticipated at some point as being possible. For example, say you dropped a piece of fuel, you would have to stand back further maybe, reassess exposure issues, and clean it up. So if something that happened that was unplanned there were still procedures in place to deal with the situation. This was in the hot cell, so it was not in an open area. I did remote fabrication and machining of different parts at SSFL. So an unanticipated event in my work could have been dropping something from the remote manipulators onto the hot cell floor. The remedy for the situation may have involved something like moving things around and getting an overhead crane to pick up the dropped object. The remote handlers made things more complicated and clumsy, but we had procedures to deal with unplanned events.

You try your best to anticipate potential problems and avoid them, but things happen as they would at any job.

Worker health was protected differently depending on the area. You had cloth masks that went over the nose as one level of protection and then a more hazardous area may call for fully sealed air supply masks with face pieces. You may wear layered clothing depending on where you were working. You may wear a lot of layers in the most hazardous area and then shed layers as you moved through sealed entryways into less hazardous areas. The clothes, such as coveralls, gloves, or boot covers would be bagged in each area and go into separate contaminated collection bins. I don't know if they had a hot laundry facility or not.

I don't know of any disposal of radiological material on site. Disposal occurred either in a metal drum for regular trash or a lead, steel, or concrete container built specifically for the contaminated waste. Radiological material would come into the facility in a protective container and go out in the same manner. Sometime we shipped fuel rods back out to an off-site storage facility, but I don't know where that would have been. Most of our fuel came originally from Hanford, Washington or a site in Idaho.

I don't have any knowledge of radiological spills, leaks, or dumping, certainly nothing illegal.

The only thing I was aware of was the disposal pond for sodium. I never saw anything first hand, but I knew of the location of a pond, also known as the Sodium Burn Pit. I heard that they would throw the sodium out there and "let it do its thing," that is, explode when it hit the water. I assumed it was uncontaminated sodium, but I don't know that as fact. I never saw sodium put in the pond when I was at SSFL. Later in my life, when I was working with the Ventura County Fire Department, I saw training demonstrations of sodium reactions and we worked closely with Rocketdyne's Fire Department. They would often instruct us because they worked with much more hazardous fuels on a daily basis than we did at the Ventura Fire Department.

I know we used trichloroethylene and acetone and probably some other chemicals at the hot cell. Chemicals were stored in metal, fire resistant containers. As far as disposal, they were all shipped out in plastic, metal, or glass containers depending on the chemical. I don't remember exactly how we disposed of chemicals. We took out whatever we had to take out and followed our established rules for that. You would monitor the waste for contamination levels and dispose as appropriate. In the hot cell, particulates would be swept up and put in the appropriate container. Damp wipes would be used as another level of cleaning, and finally you would go in with your cleaning chemicals. Contaminated solids would go into appropriate containers. Any contaminated liquid waste would go into the building's contaminated liquid waste collection system.

Building 20 had a liquid waste collection system and a gas filtration system. I don't think anything left the building immediately. Sanitary waste went to the sewer system, but everything else went into the building's own built-in disposal system. Everything was filtered. The basement of Building 20 contained the filtration system. The hot cell and the area outside the hot cell was kept at a negative atmosphere. Air would be sucked into the hot cell and then

into the basement containment filtration system where eventually it was cleaned enough to be vented out.

I am not aware of any unusual occurrences relating to chemicals other than the incident at DeSoto I mentioned earlier. I am not aware of any on-site disposal of any hazardous chemicals.

As far as policies and procedures go, as a new employee I was told what my work would entail and the purpose of it. We had sessions with the HPs and they explained the types of radiation and effects of radiation. We watched training films. We learned how to avoid exposure, how to safeguard ourselves, and how to use and read the safety instruments properly. We also learned the limitations of the safety instruments. We had various training session on different things. I think the training may have changed over time to respond to issues that arose. I'm sure I read manuals as well. The company culture was such that we complied with the rules. We knew what we were dealing with. I was pretty low on the totem pole, but I worked with very intelligent people and had all the confidence in the world in them. I think safety was on the top of everyone's mind.

I also received on-the-job training. I had a good mechanical background before I came to AI, but working there around knowledgeable people and discovering how much I didn't know motivated me to go back to school. I took an algebra class through what is now Ventura College while I was still working at AI.

I never saw or heard of anything being buried on site as SSFL. Now, I have read some things on the site, but I don't know anything from personal experience.

We documented our work at SSFL through photographs and ledgers, maybe notebooks as well. Everything was documented. You pretty much did you job and wrote it down. I don't know what happened to these records after I turned them into the boss.

If there was any disposal down toilets or floor drains it went into the building's collection system.

I think a regular disposal team used the Sodium Burn Pit, but I was never there to see anything. I do not know anything about a surface disposal areas, leach fields, septic tanks, discharge locations, storage tanks, or gas holdup tanks. I vaguely recall the Old Conservation Yard as a disposal area. I can't really say anything for sure about it though. I remember a scrap yard on the west side of the road coming into the site.

I was not aware of any problems with underground pumps, sumps, storage tanks, piping, sewer, or drainage systems.

I was primarily up in Building 20 on the hill. As far as I know everything in this building went through air processing contained beneath the building. The building was self-contained, I can't remember but I think there may not have even been any windows in the building. If something

needed processing it was processed internally before being discharged to the atmosphere or shipped off-site. There were a lot of below grade processing features at Building 20.

At one point I also got involved at SRE. As far as I remember we were down below in SRE's hot cell. I believe I was handling the fuel rods and getting them ready for off-site disposal. This was after the SRE was shut down. I also was probably involved in cleaning up the SRE hot cell afterward. I got sent over to SRE because of my skills and experience working with the remote manipulators.

I know I received some level of exposure while working at AI, but that was part of the small risk I assumed taking the job and I was not concerned about it. I remember having to scrub my head one time because some speck of radiation was found when they ran a meter over my head. You would have a final check before you could come out from a hazardous area to a nonhazardous area. You would have to run a meter all over your body to confirm you were not bringing any radiation into a nonhazardous area. They wouldn't let you out of a building until you had no detections on the meter. Otherwise, you would have to go back and shower to remove any radiation. There must have been hot and clean showers too now that I think about it.

Overall, I had a wonderful and interesting time working for AI. I really enjoyed my job.

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I worked at ETEC starting in about 1977. I had worked down at Canoga Park facility with a lead engineer that I was familiar with. He started up a new instrumentation group at SSFL and I requested a transfer to go up on the hill too. Later I transferred back to Rocketdyne. I think I worked at ETEC from 1977 to 1985 (about 7-8 years).

I was an instrumentation engineer. I tested the various sensors that were to be used in the sodium cooled reactors to evaluate their performance, dependability, and reliability. I tested level, temperature, and leak detection sensors, made mostly in the US, but some from Germany and possibly a few others countries as well. Before I went to work for Rocketdyne and Atomics International, I had worked for an electrical heating company in the Pittsburgh, PA area. Due to my electrical heater experience, I specified the types of heaters to be used, approved drawings, purchased heaters, and ensured the heaters were installed correctly on various tanks and lines. I was the resident expert on electrical, tubular heaters, but my primary responsibility was in testing sensors to evaluate how well they performed under different working conditions. I worked on small projects helping others with heaters or liquid level sensor devices. I also wrote reports on heaters and liquid level measuring systems and provided them to DOE.

I worked in an engineering building; really, it was a group of trailers across the street from the Instrumentation Lab. Later they built a more permanent engineering building adjacent to the trailers and I moved into that building. I also worked in Building 104, which is where I think most of my work was conducted; there were sodium tanks in that building for us to use for our testing.

I did not work with radiological materials, nor did I wear a film badge.

I did not handle any hazardous materials. I did not work around any hazardous materials unless you count sodium. I never handled sodium but I worked around it. I never had to wear any protective clothing for my work. I did not knowingly work around anything that I considered hazardous to me personally.

I know of an area where they had a reactor that had some sort of meltdown and they closed it and put asphalt over top of it, but that was prior to my time on the hill and was all gone by the time I worked up there. I was not aware of any radiological spills or leaks while I worked up there. I do not know of any chemical leaks or spills up there that would be hazardous to people either.

There was a chemical laboratory – but I rarely went in that building. I believe it was the general practice to put hazardous materials into 55-gallon drums that were eventually shipped off site. Since I did not do that myself, I am just telling you what I was aware of. They were very careful up there. They had very strict procedures as to how things were done, such as with the handling of liquid sodium. It was pretty rare circumstance that anything went wrong.

I did not need much training for what I did at ETEC as I had a lot of experience from prior positions. My supervisor did make sure I understood the correct procedures for everything, but I did not need any special training. We got on the job training for how to follow the procedures.

A typical experiment would involve putting liquid level sensors in a proper position in a tank. In Building 104 for example, we would raise and lower the level of sodium in the tank and see if the sensor responded properly. We would test the sensors under different temperatures to see if that affected performance. We would test the performance and reliability of the various sensors and then write a report of the test results.

We obtained a lot of data, and gave that data to DOE in the form of reports. The original report went into the DOE library that was north of the administrative building for ETEC. Three women worked there. One copy was in the library, one copy we kept in our building, and one copy went to DOE. The results were not sensitive, we were just reporting on how the instruments performed, so we did not control the distribution of the reports. I do not know what DOE did with the copies of the reports once we gave them to them.

Once or twice a year, someone from DOE-HQ in Washington, D.C. would come up to check on what and how we were doing. I would demonstrate how I tested the various sensors and heaters.

Virtually everything we did at ETEC had a purpose.

We tested the sensors to see if they operated properly. We tested to make sure they detected leaks. We created leaks on purpose to see if the sensors would detect the leaks. We wanted to know if the sensors were working properly. We detected leaks because we caused leaks – it was purposeful to test the sensors.

I would recommend that you talk to others that worked at ETEC during this same time period. The others may not have responded to the opportunity to be interviewed since it came in the form of a letter. It might be better to give these other workers a telephone call; it may result in a more positive response! (Names of a few other engineers were provided.)

There was one building at ETEC that had a fence around it and barbed wire on top. They reprocessed fuel rods or something, but I never went near that building I just saw it as I went on my daily noon time walks to the water tower to get some exercise. It was the only building considered to be dangerous that I knew of. I did walk by the sodium burn pit now and then. Occasionally, there would be a dead animal in the pond. The sodium burn pit was a pond – sodium ignites when it comes into contact with water. They would put items that had been contaminated with sodium in there to burn the sodium off. It was a controlled situation when they did it. I did not observe it; in fact, I think it happened pretty rarely. It was not a pretty place.

I worked in Building 104, the instrumentation lab, where my primary work occurred. I went into most of the buildings at ETEC because I had associations of various kinds with different experiments going on, but I was never in a place where hazardous chemicals were being handled that I knew of.

There had to be some leach fields or septic tanks on site. I do not know where water went. The water on site was not potable. We drank bottled water in all of the buildings.

I know about the old conservation yard. It had mostly metallic junk, stuff that was no longer needed. I would go there to see if there was anything I could use – like tanks or piping – to save money. They encouraged us to check there before we ordered anything new. There were occasional items that could be reused for other experiments.

There was a large fuel tank, I think it has been removed, that was full of oil that they used for experiments. An oil line connected the tank to one of the buildings.

There were various types of sodium tanks at ETEC. They were aboveground, as they had to be heated and insulated. They had trays under them to capture any leaks. Of course, there were sensors to detect any leaks as well. They had trays under them just in case. There were a lot of safeguards to prevent sodium leaks in place by the time I worked up there.

Air contaminates sodium. They did not want to contaminate the sodium. Leaks were not good.

Of course, we caused leaks so we could observe the results. We wanted to see if we could cause a fire or an explosion. The leaks were purposeful. We made them for experimental purposes. They were purposeful leaks.

You may be aware that there is a corner of the San Fernando Valley where an unusually high number of people have been diagnosed with cancer. My ex-wife claimed that she had cancer caused by exposures she received as a result of working up at SSFL. I was tested annually after I worked up there. Now that I am no longer working up there, I am not tested. I try to pay attention to what is going on at ETEC with the cancer cases so I can determine whether I should be concerned.

I am amazed at the reported costs of cleanup at SSFL. I am afraid it is a bit of over-kill. It is hard to believe there is sufficient contamination up there to require all the cleanup going on. I do not know how they can spend so much money to clean that place up.

I am concerned that they will never get it cleaned up to everyone's satisfaction. I pay taxes and the money being spent on this clean up does not seem justified.

To the best of my knowledge, no one purposefully caused any contamination. While I still worked up there, they would bring a trailer on site every so often and I participated in voluntary medical testing, with tests such as breathing into a tube to test our lung capacity or blood tests.

We would only hear about results if the results were out of the normal range. I was told that I tested fine.

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I worked for Atomics International (AI), Rocketydyne, and Boeing at the SSFL from 1957 to 1989 for a total of 32 years. I had worked in almost every building on the hill by the time I retired. I was a mechanic, an MTS3, and then the Engineer in Charge (EIC) at the RMDF.

I first handled radioactive material in about 1965 when I worked in Building 5. We had been doing heat transfer studies with loops using non-radioactive materials. Then we received radiologically-contaminated organic material for use in our loops in Building 5. That was my first encounter with radioactive material.

I received schooling and training on how to handle radioactive materials and what we were expected to do before we did anything. By that time, the AEC was coming up with all sorts of rules so we could protect ourselves and the company. I was under the impression that before 1965 safety had been much more lax. But by the time I was involved in handling radiological materials, the AEC had established some guidelines for safety. For my entire time at the site, I was always under the eyes of an HP (health physicist).

I worked for Rocketdyne from 1957 to 1960. In 1960, they laid off 10,000 people and I was one of them. I had worked for one of the Von Braun engineers who had come over from Germany. He and I were friends and he helped me get a job at AI in 1960. My initial years at AI were spent working on heat transfer studies with loops. At first we worked with organics and not radioactive material. We would go into a room full of pipes and cover them with asbestos. The asbestos would be thicker than all get out. We didn't know at the time that asbestos would later turn out to be a hazard. That was one of the health and safety changes that occurred during my time at SSFL.

During my days at Rocketdyne, we used lots of trichloroethylene and acetone to clean engine parts and didn't worry about where it went. We used every kind of chemical known to man at Rocketdyne. I was a crew chief in gas generation at CTL-2. We would stand on a grated platform about 10 feet from the ground and use chemicals to clean the rocket engines. All the chemicals would drain down from the test stand into a holding pool of water located below the grates we were working on. The pool would drain to holdup ponds outside the buildings. The fire department would then come along about once a month and set the ponds on fire to burn any chemicals off.

Over time the safety got more stringent and we had more training. We eventually started catching any chemical runoff and putting it in barrels. A group was created to handle waste at the site. There was an evolution of safety in my 30^{+} years at the site on both the Rocketdyne and AI side.

When I first started working with radiological material in Building 5 we had safety procedures to follow. We had to dress appropriately and we had to protect the area we were working in by controlling access. You had to clean the area when you were done and put radioactive waste in

RA (radioactive) disposal containers. The door going into the lab had radioactive stickers to let everyone know that it was a radioactive lab.

Dressing appropriately for radioactive work in Building 5 included shoe covers, coveralls, a soft hat or head gear, and a couple of pairs of gloves. I didn't have to wear a respirator in Building 5. I always wore a film badge and dosimeter my entire time at AI. Those were standard issue at AI even before I worked with radiological material. I was told that I got the most radiation of anyone who worked at Rocketdyne. We were supposed to wear the film badges at work, but it was like our company badge and we got so used to it we put it on all the time. A few times I even wore it home.

The level of radiation was so low in Building 5 that time limits for exposure were not in place yet. Most of the contamination in Building 5 was alpha contamination so it wouldn't penetrate very far. I did have blood and urine samples collected at least once a year while working in Building 5. When I later moved to the Hot Lab, I was monitored monthly because I was working with more radioactive material. There was a monitor at the entrance of the radioactive lab room and you were expected to monitor yourself entering and leaving the lab. I don't remember if there was a building alarm for Building 5. The radiation levels were low in Building 5 and there were no reactors in the building. I never received any exposures in Building 5.

There were 13 reactors on the hill over the time I worked there. I didn't work in any of the reactors when they were operating, and I didn't handle radioactive material until the coolant went to Building 5.

I moved to Building 20, the Hot Lab, after my time in Building 5. That became my primary place of work. That was a high radiation lab and Building 20 did have a building alarm. You had to sign in and out of the building near the entrance. The health physics office was near the entrance as well and you would go there to get a film badge or dosimeter before leaving the lobby if you didn't already have one on. Building 20 had all kinds of barriers because there were different levels of radiation in the building. If you were in the operating gallery you didn't have to wear any protective clothing, unless you were handling something that could penetrate the walls. If you were on what we called the backside of the building, or the service gallery on this floor plan I have, you had to be fully dressed with coveralls, gloves, and boot covers. If you were "in cell" you had to add another set of coveralls and a respirator. The hot cells had 4-foot thick walls and radiological glass to keep the radiation in the cell. You also had to wear a respirator if the hot cells were being opened or if you were transferring radioactive waste.

When you came out of the hot cells, the first thing you would do would be to take off one layer of clothing in the decontamination room right outside the hot cell. That top layer would go in a container for disposal as radioactive waste. Then you would step into the hot change room room and take off the second layer of clothing. The hot laundry was packaged and sent to the loading dock area and off to the hot laundry facility where the clothes would be cleaned and

could then be reused. So when you had two layers of coveralls on to work "in cell" you would remove one layer in the decontamination room and then you would remove the second layer in the hot change room. Masks were also laundered and a "cold guy" would help you take off the mask and place it in a bag for laundry.

Once you were naked, you would go into the shower to rinse off. There was a monitoring device between the hot shower and the cold change area and you would have to check yourself. If anything was picked up on the monitor you had to go back to the hot shower for another rinse to get any remaining radioactivity off of you. You didn't leave the hot shower room until the monitor said you were clean.

The operators that had to set up equipment in the hot cells wore lots of protective equipment and multiple layers of clothing and gloves because the hot cells were really hot and dirty. You always wore a respirator with supplied air in the hot cells. Depending on what you were working with, you may even wear three layers of coveralls in the hot cell. Sometimes if you were going "in cell" to clean the cell you would even wear raingear.

Safety rules became more strict as time passed. I had the feeling that before I was there safety was less stringent. During my time there, we had monthly unit meetings to keep up to date on safety and training issues. We took it very seriously.

We were mostly company people and we were there to invent things. Two or three people were just there to get a paycheck, but the rest of us looked forward to going to work. We worked for engineers, inventing new things for the nuclear industry because it was a brand new field. The engineers often had an idea in their minds of what they wanted their experiment to do and we would talk to them to see how we could develop the tools and equipment they needed for their experiment. Many of the young engineers didn't know the difference between a wrench and a screwdriver. The engineers got the projects and the money, but we were the ones that had the practical experience to help them develop their experiments. We looked forward to accomplishing things at work.

The Hot Lab had a hot storage room behind the hot cell. The guy who ran the place, BDE, was a strange duck. He used to be a piano player from Las Vegas, but he made sure the backside of the Hot Lab was run properly. Before he got to the Hot Lab, there wasn't a "dedicated backside man" at the Hot Lab. This was a problem because we found things that were too hot in the backside of the Hot Lab and they shouldn't have been there. He fixed that situation though. I don't think enough money was spent on waste management in the early days. We didn't have dedicated waste handling like we had later. This was another example of the evolution of safety. In hindsight, things should have been cleaner and we should have gotten rid of waste faster.

We had a hot storage and equipment room in the Hot Lab that would store things like a milling machine, drill press, or tools that we needed for operations in the hot cell. The work would change so we would need different tools, but they were all stored in the hot storage. Casks

would come in through a door at the north side of the building, through the mock-up and assembly areas. In the case of fuel elements, it was because they were too long to enter the building any other way. The size of the material dictated where it went in the Hot Lab. Metallurgical work was done in Cell 1 because this involved the smallest pieces of fuel. I had to modify and build a machine that would cut out small pieces of fuel and cladding from a fuel element so we could actually work with it. Cell 4 held the largest pieces of hot material, often a section of the fuel rod. As fuel rods were dissected and smaller pieces were removed for examination they were moved into different cells. I remember cutting out small sections of the fuel elements from the SNAP 10 reactor for study in Cell 2. We looked at very small pieces of fuel; it was too hot to work in large quantities. It could make the lens of a microscope go black from high levels of radiation. So we had to invent a system that allowed us to look at very small portions of the fuel. You didn't need a big piece of something to examine it in the metallurgical room.

Waste from the Hot Lab went into casks, which were essentially lead-lined barrels that were sized based on the quantity of waste and the radiation level. Casks were sent to the RMDF, now called the RMHF. We held the casks there until we could complete all the paperwork necessary to ship the waste off-site for burial.

I worked at the Hot Lab for many years on and off. Every time we had a slow period I got farmed out because I was an instrumentation guy. I could work with anyone on the hill.

When the SRE was finally shut down, they ripped all the instrumentation out and got rid of a lot of stuff. In 1975, they found some residual sodium in the reactor vessel. They asked me to go over to the SRE and figure out where and how to hook up the existing thermocouples and heaters. That was a really fun time. I became the lead man on that project and worked on dismantlement of the SRE. We needed to heat up the reactor vessel to melt the sodium to a liquid so it could be removed. Because they had ripped the old instrumentation out of the control room, I had to go find and install the instruments and figure out the electrical wiring for heating elements located on the outside of the reactor vessel. I had to find the correct heating elements on the vessel and their corresponding switches on the electric box with thousands of wires and make sure everything was connected properly. Once this was done we could heat the vessel to 230^{o}F to melt the sodium. Just to be clear, we did not run the reactor. We just reconnected the heating elements on the outside of the reactor vessel to heat the sodium to its melting point so we could remove it.

Before we could even get to the reactor vessel though, we had to dig out the dirt around it because the reactor was buried in the ground. We removed the 4-foot thick magnetite concrete, which was a concrete with steel shavings in it that surrounded the reactor vessel. When I was working on SRE dismantlement I also had to deal with the "dip-leg tube." The "dip-leg tube" was a tube that went down 20 or 30 feet into the ground. It was located in a separate pipe gallery beside the reactor vessel. We found radiation at the bottom of that hole and it "gave me terrible fits getting that cleaned up." In fact, a piece of concrete fell on my head when I was working in that area. It is a good thing I had a hard hat on.

I worked on the dismantling the SRE from 1975 to 1980. Then in 1980, I was sent to the RMDF as the EIC. We started getting rid of a lot of things at that point because there was stuff stored everywhere. I worked at the RMDF from 1980 to my retirement.

As far as spills go, I only have first-hand knowledge of one spill at the Hot Lab, but I have heard of others. A holdup tank was located in the basement of the Hot Lab (Building 20), under the operating gallery, and it had a line that came out at the north end of the building to a transfer tank. A tanker from the RMDF would pump the radioactive water from the holdup tank and take it to the RMDF where it would be put in an evaporator and reduced to sludge before being disposed. One day either the hose broke or the tank outside the Hot Lab overflowed, I can't remember which exactly, during the transfer process and contaminated water spilled onto the asphalt. The asphalt on the north end of the building became contaminated with the radioactive water. We spent quite a bit of time cleaning that up. We had to invent a super vacuum that used HEPA filters to clean up the contamination. We also used foam to help clean up. We kept cleaning until we brought the radiation down to acceptable levels. That is another safety issue that has changed over time – the acceptable level of contamination. What was acceptable then may not be acceptable now. I'm sure that incident was written up in an incident report.

I also heard that the asphalt behind the loading dock on the west side of Hot Lab was a spill. I heard later that they dug down about 10 feet to make sure they removed all the contaminated dirt. That was after I had left though.

Additionally, there was a driveway along the east side of the Hot Lab. At the northeast corner there was a 10-foot high bank. Before the days of chemical containment, chemicals from the shop area of the Hot Lab, such as trichlor, acetone, or paint thinner, were dumped on the ground down this bank.

When I worked at the RMDF, everything that came in there was already packaged. Depending on exactly how it was packaged and what level of radiological contamination it had, we either had to repackage it, clean it further, or just complete the final necessary paperwork. Some waste at the RMDF came from DeSoto, but most of it was from SSFL. The level of radioactivity also dictated where the material was stored at the facility. There were different areas specified for each level of radioactivity. Highly radioactive fuel that came to the RMDF was stored in the RMDF Vault. The vault contained cells designed to hold fuel elements. A 50-ton crane would lower a cask that contained four or five fuel elements onto the vault floor. Another manipulator would then transfer one fuel rod and place it in one vault cell that was then topped with a plug. The cask would move to the next vault cell and lower the next fuel element in so that each fuel element was stored in its own cell. The RMDF stored waste, but it also stored items that were waiting examination in the Hot Cell. So some material was stored at RMDF until it could be examined at the Hot Lab, and then when it was done at the Hot Lab it would come back to the RMDF and await final off-site disposal.

We stored all kinds of chemicals at the RMDF and I don't think we did a good job managing the chemicals in the beginning. Eventually as safety regulations changed, they decided it wasn't a good idea to have all those chemicals sitting around so we started getting rid of the chemicals. We also started using chemicals much more sparingly. We also stored a lot of radioactive tools and equipment at the RMDF that had been used at other facilities.

At one time they washed towels at the RMDF. This was not hot laundry. The washing facility wasn't that good and by the time I got to the RMDF, they had gotten rid of it. But we still had 10-20 barrels of soap left over from the laundry facility. Eventually they asked us why we were keeping them around and we got rid of them.

The RMDF had some spills over the years. There was a spill into the leach field that happened before my time. I only learned about it because we had a big program, with a big budget, to clean up the leach field. It was going on while I was at the RMDF, but I wasn't directly involved in the cleanup at the leach field itself. The people working on the cleanup had to be fully dressed in protective clothing that was supplied by the RMDF.

If something occurred that was unplanned we would call RST first. He was the manager at Building 20 and then became the manager at SRE and RMDF. Everything went through RST no matter what it was. We would also call CEF or an HP if they hadn't been called first. After making the phone calls to the appropriate people, you would all work together to determine how to deal with the unplanned event.

The film badges measured your accumulated daily exposures and they had to be processed. Our film badges were given to HP once a month so they could be sent to Chicago for processing. HP would keep track of your lifetime exposure. A dosimeter measured your minute by minute exposure and could give you immediate feedback. We were only allowed to be exposed to 120 mR a week and 5 R a year when I was there. If one of your two dosimeters pegged for any reason (even if you suspected it was inaccurate) you had to leave the area immediately. The 5 R a year exposure limit was a North American limit. I think the government limit was 20 R, but North American set higher safety standards than the government.

Going back to the Hot Lab, anytime you worked in a hot cell you had to wear two new film badges. You would take off your monthly film badge and put it in your locker and then sign out two new film badges from HP. Then when you got to the backside of the Hot Lab you would put on your two new film badges and a dosimeter before going into the hot cell. The reason for this was that you knew you were going into a very hot area and they wanted to separate out that daily exposure in a hot area from the monthly exposure where you may be working in a variety of different areas. HP would add the hot cell exposures to the monthly exposures so they still kept track of lifetime exposures; they just kept the records separately. There was absolutely no on-site disposal of radiological waste to my knowledge. I mentioned the spill at Building 20 from the transfer tank overflowing, the leach field spill at RMDF, and the "dip-leg tube" at SRE.

Originally we were supposed to save the SRE building. It was going to be used as a building for the Saturn rocket. We did a lot of work to clean up the SRE building over the years and it was really disappointing to me when the decision was made that the building would never used again. It was sad to see it demolished. That happened to a number of buildings. We cleaned them up for reuse, but they were not used and eventually demolished.

As far as chemical handling went, we didn't contain anything when I worked at Rocketdyne in the late 1950s. It wasn't until the 1960s when I was at AI that I think we started looking at containment of chemical waste. I don't remember exactly when we initiated chemical containment at Building 20, but it came through training sessions from the Health and Safety Department.

I had a couple of jobs that involved searching through junk that was deposited in canyons. Debris, deemed to be clean at the time, had been disposed in the canyons and when we learned about the hazards of asbestos I had the job of searching through the debris piles to get the asbestos out. This occurred when I worked at RMDF when I was heading up D&D teams.

At some point, Rocketdyne outlawed the use of Trichlor. I don't remember exactly when. When that happened, our chemical standards at AI changed as well. Where we used to have Trichlor delivered to us in 50 gallon drums, our delivery dropped down to 2-liter jugs. We still used it, but much more sparingly. The safety rules evolved, but so did the chemicals. New cleaning chemicals were being invented. The chemicals were just getting more volatile and more dangerous. At AI, we wanted anything associated with the reactors to be clean and dry. We didn't want there to be any oil that would hold contamination. But at Rocketdyne, cleaning involved making sure there was nothing left on equipment that would react to oxygen. So while cleaning was important to both sides, there were different purposes for cleaning.

After about 1980, I know that TCE was found in the groundwater under the reactor in Building 59. One of my jobs was to set up the sump pumps to capture the groundwater. Normally, there was an automatic pump that continuously pumped the groundwater from the reactor building. The water would go to a holdup pond where it would be monitored for radiation and if there was no radiation it would go to another pond before being released. Once TCE was found to be dangerous, we had a program to catch it. Early on, we pumped TCE-contaminated water into a tank and hooked an air compressor to the tank to help evaporate the TCE. After a week or two, chemists would test the water to see if it was safe to release. That doesn't seem like such a good idea, looking back on it now. Now, they filter the TCE-contaminated water instead of evaporating it. We didn't get rid of the TCE – we just released it into the air instead of onto the ground.

Every building had chemical storage lockers located outside of the building. They were fire safe lockers and were marked for the specific type of chemical that could be stored in them. There were special cabinets for each type of chemical. We also had catch barrels that stored the used chemical material. Rocketdyne eventually created a waste management unit that was responsible for picking up the used chemicals and take care of them properly. Since they were

the bigger organization they had more capacity and they could pick up chemical waste throughout the entire site.

I don't recall any unplanned events or on-site disposal that dealt with chemicals. Chemicals weren't my focus though. I am not sure when the fire department stopped burning chemicals off the ponds.

We had a lot of company policies and procedures, including large books of information. We had monthly meetings were pertinent information to our operation was passed on. In Building 20, RST had a young engineer who was in charge of policies and procedures for his facilities. RST would make sure we were doing things properly. The policies changed continuously. Rockwell/Rocketdyne was adamant about keeping current because they had to bid on government contracts and the contacts had a lot of procedural requirements. People were generally good about following the rules. Some of us may have been reluctant to implement new rules, but generally, everyone followed the procedures. I'm sure CEF, our head HP, would cringe if he heard my name. He didn't always think I was doing everything I could. One of the toughest things for me was to quit smoking. I finally was able to do it when they told me our health insurance premium would double if I kept smoking. That gave me the motivation I needed; it was hard though.

Training depended on the job. There were certain health and safety courses that everyone had to take, such as how to dress and wear masks properly, how to read and understand signs and sirens, or how to properly climb ladders with a SCUBA tank on. Everyone was indoctrinated. Then specific jobs may require specific additional training. Due to safety rules becoming more stringent, we had to be trained in the use of SCUBA gear. We had to demonstrate that we knew how to operate the gear properly and we even had to be able to climb a ladder wearing it. We had to be recertified every year in some of the required skills. We would also have health and safety meetings to be advised of new or changing rules or procedures. There were also some specific rules for radiation workers, such as men couldn't wear beards.

I don't recall any contamination being buried on the site. The debris disposed of in the canyons was deemed clean at the time. I think it was buried as landfill material. Once we learned about asbestos, we went back to dig any of the asbestos out of the debris. This was in the early to mid-1980s. I think the debris may have been disposed in the canyon near the Burn Pit.

We would document what we did in weekly highlight reports that we had to give to RST, our unit manager. It was a written report of what we did in the week. It would be published and he would send it to his manager, DFG. I didn't have to keep any log books for my work, but EGH kept the best log books. He kept them because he had a higher classification than I did and that was part of his job. In all my time at AI, everything was documented! It was part of the culture to document everything. It is possible that some people didn't document things before my time, but I don't know for sure.

I don't know of any liquids being disposed of in toilets. The drains in Building 20 all went to a holdup tank in the basement. The holdup tank drain was kept full of water to prevent backflow. The only things that weren't connected to the holdup tank were the bathroom drains and they were connected to the sewer system, but I don't recall any liquids being disposed in the toilets.

The Sodium Burn Pit was not the best place, in fact, it was a bad place. It was not supervised as it should have been. Everybody at AI used it for cleaning chemicals. It was a big pool and you would take sodium contaminated things to the pit. Generally people dropped stuff in the pond to clean the sodium out, then fished the items back out of the pond, and finally left the items outside the pond area on the ground. Eventually they authorized a salvage operator to come up and haul the material away. The Sodium Burn Pit was out in "left overshoe." The HPs monitored it constantly. There was a lot of stuff that was taken there. There was one strange incident I remember about the Sodium Burn Pit. One day there were a bunch of generals in the area and a guy had a bunch of glass balls full of sodium. He was standing on a rock and throwing the balls into the Burn Pit and letting them explode. He was suggesting to the generals they could be hand grenades for use at the rice paddies in Vietnam.

In 1984 or 1985, the Sodium Burn Pit was drained and radiation was found. They had to let the pond dry out for a while. FHI was working on cleaning and digging out the Burn Pit. He would know about cleanup there. We had worked together at the "fart factory." That's what we called Building 5 because there was sulfur dioxide (SO_2) involved in the coal gasification process. One interesting thing that was also done in Building 5 was the grinding up of old x-rays from World War II. The x-rays were ground up and reacted with salt to extract silver from the x-ray. They could get about 99.9% pure silver back from the x-rays.

I am not sure about a surface disposal area. This might have been an area where contractors took construction materials and debris from building demolition or it could be an area where asphalt and soil were piled up for monitoring. I don't have any other information about leach fields, septic tanks, or drainages other than what I have already told you. Everything went to holding ponds and the HPs would monitor the ponds.

In 1977 or 1978 we had a lot of rain and the holdup ponds were overflowing. I would get a phone call in the middle of the night that a pond alarm was going off. This meant the water level of the pond was getting too high. I would have to go up to the hill in the middle of the night and we had to catch any excess water from the holding pond. We would use whatever we had to catch and manage the excess water, including those plastic swimming pools for kids, 55-gallon drums, and pumps. We had to catch everything because the HPs had to monitor it to see if it was clean. Even though it was presumably clean, it was rain from the sky, the fact that it fell in areas where radiological or chemical material was used meant we had to monitor the water. If it was clean it could go to the Rocketdyne holdup pond.

A picture I have shows how careful we had to be at SRE when we were dismantling it. We had to set up tents in the building to seal off areas we were working in and contain any air contamination. The men working to jackhammer concrete or other material worked under the

tents to keep any contamination from becoming airborne and they had to wear full respirators. We did not "jack the building up" and lay it back down. We dug under the building and systematically dismantled it.

There were three areas where water would pool at the bottom of the SRE when we were dismantling it and we had to put pumps in those pools to take the water to the SRE pond. We had alarms go off there when the pond got too full.

The RMDF had a 10,000 to 20,000 gallon holdup pond down to the west, past Building 75. That pond had alarms and radiation monitors on it. During the rains, we had to store all the excess water in 55-gallon drums so the HPs could monitor it. We had a lot of drums that had to be stored in an outdoor storage area at the RMDF complex so they could be verified as clean before being released. One whole parking lot was full of drums of rainwater.

The Old Conservation Yard was a favorite place to get recycled equipment. We would go there to get equipment or materials for building things. We could reuse parts left there and we were encouraged to do so.

I don't recall any gas holdup tanks. All radioactive facilities had HEPA filters that filtered the air and gases.

I can't think of any other issues with pumps, sumps, tanks, piping, or drainages other than what I have already told you. There was a sewer pump located north of the Box Shop that went bad one night and all the buildings on that line got backed up. Maintenance crews fixed it in the middle of the night.

I was told I received the most radiation of anyone working up there. In those days, we were allowed a lifetime exposure of 100 R and one HP told me I had been exposed to 85 R, the highest of any employee. The company doctor would always monitor us and document everything. When I left the company I had to get a family doctor and I made sure to tell the family doctor about my work history. I have never had any health problems that I attribute to my work on the hill. I did receive an extra large dose one time "in cell" at the Hot Lab and I couldn't go back in there for a while. I was in a lot of radiation fields with the kind of work I did and I would get high doses of radiation. Another thing that changed over time was they changed the dose rate to sieves or sieverts. When I retired, I got a document that told me I received a lifetime radiation dose of 38 sieves.

I had a wonderful time working at SSFL. Every day was new and exciting. I worked in every building up there. We had a lunchroom in the middle of the shop in Building 20 and we would play cards and ping pong during our lunch hour. There was a lunchroom in the RMDF as well. The lunchrooms were always isolated from any radioactivity. We would also see a lot of wildlife up on the hill, including mountain lions and bobcats. Mornings I was at the SRE we would see mountain lions on the rock outcropping above the building. I really had a fun time working there.

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I worked for Atomics International from 1967 to 1985 as an atomic reactor inspector and certified x-ray technician. I also conducted helium leak tests and magniflux non-destructive tests. I worked in a number of buildings, but never went into a building unless I had a reason to be there. I have a few concerns about the Santa Susana Field Laboratory.

One of my concerns is with Building 4059, which was a reactor building. I know they took sand that was discovered to be contaminated out of the pit. I don't know what else they have done since then. I heard the building was torn down. Building 4059 was the last reactor that went in and the reason I know that is because I was the inspector when the fuel rods were placed in the vessel. That reactor ran about a year and then they took everything out.

I am also concerned about the large pit that had been dug out for another reactor or test site that was located between Building 4059 and Building 4626. The pit was out in the field a little ways from the road that comes down past Building 4059 and 4626. I have seen the overhead pictures of it. I think it has been filled. They were filling it when I left with miscellaneous dirt and concrete, but the fill material was not radioactive or anything like that.

I worked in Building 4005 and we made fuel rods for a reactor. That building has been cleaned up and used for other purposes since then. I don't think there were any problems in Building 4005. We didn't manufacture a lot of fuel up there.

Building 4022 was used to store radioactive material. It had a storage facility in the floor and you would take the cap off and put a fuel rod down there. They monitored that pretty close. I don't know how much fuel was stored in the building, because I only went to the building to magniflux the hooks on the cranes. I don't know anything about 4022 other than it had a fuel rod storage area. I don't know exactly what Building 4021 contained, but I suspect it had some radioactive material also.

Building 4012 was a reactor building that had some radiation in it at one time. It was cleaned up and we used it for an x-ray lab in later years when I was an x-ray technician. The walls in Building 4012 were 3 feet thick. If I was going to be x-raying in Building 4012 with cobalt or a 350 KV x-ray machine, I had to call security first so they would adjust the radiation monitors that were across the road and down the hill. Even with 3-foot thick walls, without that adjustment, alarms would go off in nearby facilities when I was x-raying. They could adjust the monitors so that they were not as sensitive as they normally were for the duration of my x-ray work.

Building 4021 and 4022 had outside drainage systems, most likely for handling rainwater. They did not expect the water to have radioactivity, but they monitored those systems just in case.

I know that everything was removed from SRE, the building was jacked up and everything below ground level was removed. I never saw anything in the sublevel basement until they started tearing it out. Everything was removed, including surrounding dirt. The dirt was packaged in boxes and shipped to a radioactive disposal site in Idaho or Nevada. I used to sign the shipping forms when they shipped that stuff out in the mid-1980s. I remember signing the form, but not where it was being shipped to.

The only time I handled any amount of radiological material was when I worked in Building 4005. Not a lot of us actually handled radiological materials. I didn't handle radiological fuel rods that went into reactor in Building 4059, but I was there and they were taking numbers off them and I was recording them.

There wasn't a lot of handling of radioactive materials as far as our group was concerned. I was in Building 4005 and working out of Building 4011 at that time for Atomics International, but there wasn't a lot of radioactive materials handling in those buildings. In ETEC, we didn't handle radioactive material other than a cobalt source and iridium source in the x-ray lab.

There was another building up there that I was in one time that had a reactor in a vat of water. The building was used for neutron radiography, but I went in the building to magniflux the hooks. I assume that building is long gone.

As I mentioned earlier, they took the reactor out of Building 4059 years ago and then they set that building up for other tests at that time. Even though Health & Safety said Building 4059 was a safe building to be in, I went in with my own equipment, including a Geiger counter, and walked that whole building to make sure it was safe. I did my own checking to verify that Health & Safety was right. When we were working in Building 4059, we wore rubber gloves, and in some cases booties and coveralls. When you come out of the work area you removed clothing or anything else that had become contaminated and put it into a separate container for disposal as radioactive material. So they took pretty good care up there.

Anything radiological was shipped off the site to a burial ground in either Idaho or Nevada. I am not aware of anything being buried on site.

I heard of something not going as planned at the SRE, but this was before I went to work on the hill. I heard that they had a holding tank for lightly radioactive liquids and it overflowed, drained into a gully, and Health & Safety was out there picking up radioactive material with table spoons. That's how little radioactivity was spilled; they could clean it up with spoons. It was a small spill that was removed with very small equipment. I was told that it was completely cleaned up.

I have had people in Simi Valley tell me that there has been radioactive material that has come down a wash from the hill and drained all the way to Royal Avenue, but I find that hard to believe. We were pretty safety conscious up there. By the time I started working on the hill in 1967 people were a lot more conscious of contamination than they had been years before. I

can't vouch for anything that happened up there prior to the time I got up there, but I would not be afraid to go up there and set my motor home up and camp out.

The only incident I can tell you from SRE other than the minor spill from the overflowing holdup tank was when they cut the vessel out and removed it. They put it on a flatbed truck and were taking it off site, possibly to Idaho. They got down off the hill and before they got to Topanga Boulevard, the flat bed collapsed. I was not at the scene, but I was working on the hill at the time. They had a crane in there within minutes, loaded the material on another flatbed, and took it back up on the hill. They strapped it down securely and left it in Building 4022 overnight, and then hauled the vessel off site again the following day. There was no radioactive spill from it, but in the vessel was radioactive material. There was no contamination down there that I am aware of because they had Health & Safety down there real quick.

I am familiar with the Burn Pit near the Building 4886 area and don't think this area was used as it should have been. It has been cleaned up. I was never out there, but I know they took piping out there with sodium in it. They had a pit of water and to clean the piping out they would dump the pipe into the water and of course water and sodium don't mix.

As far as monitoring worker exposure to radiological material, I understand from others that in areas like the SRE people could suit up and go into the heavily radioactive areas and work for about 20 minutes and then they had to come out and another crew would go in. This was the case when the SRE building was being modified after the reactor had run for a while. And that was the way it was handled when there were any highly radioactive areas. That was before I got up on the hill though. At this point it is all hearsay, but I feel there was some other place where cleanup of radiation occurred and people could only go in for a short time. They also wore badges, film badges and dosimeters.

When I went out in certain areas I wore a film badge, a dosimeter, and in some cases two dosimeters because occasionally one would go off scale. If one went off scale it was not always clear if it was accurate because badges could be defective or it was possible to bump one and set it off. If you wore two badges and one picked up something, but the other didn't you knew you were probably okay. The only time I went into areas where I had to wear the badges was when I was x-raying.

We had a couple of mishaps up there with an x-ray technician that wasn't paying attention. An example occurred in Building 4032. I was in Buildings 4036 and 4037, which served as office areas near Building 4032. A guy was x-raying in Building 4032 with a cobalt source and I was up there to make sure the people in the office were in a safe area because cobalt splatters all over and can go through 7 inches of steel and 1 inch of lead. I noticed the radioactivity went up as the x-ray technician was running the pill back into the "pig," as we called it. The pill went up and never came down. The technician tried to lock the source up in the pig, but it was still hanging out of the pig a little bit. So the technician got exposed to a little bit of radiation. That was what I called clean radiation. It didn't emit anything that would be harmful for you to breathe, but it sure could kill you if you got too close to it.

I am not really aware of any other spills or disposal, other than the SRE holdup tank overflowing.

The only other building I was in on occasion was Building 4020. That was the Hot Lab. I never heard of any spills in there, but when I was in there you had to wear a film badge and a dosimeter. They remotely handled radioactive equipment in the Hot Lab. The operators looked through windows that were essentially two panes of thick glass, separated 30 inches apart, filled with clear oil between the glass panes. I understand that they would pull some fuel rods in there and use remote handlers to put them in a lathe, remove the cladding from the fuel rods, and reclaim the fuel. I wasn't in there for that purpose. I went in there to helium leak test some things they were making up, little radioactive materials they were making up for the space program. I remember running some helium leak tests on little bolts about 1/4 to 1/8 inch in diameter and 1.5 inches long that they had drilled holes in the end of and put a piece of radioactive wire into it before welding it closed. Those bolts went into something destined for outer space.

Building 4010 was a reactor building. The reactor was removed and everything was cleaned up before I left in 1986. We used the control room of Building 10 as an office for our department.

At one time in Building 10 there were caskets of fuel rods that were already made up to go into either the SRE or the Hallum, Nebraska reactor. We used to go check the inert gas in the caskets to make sure it was acceptable. I remember the fuel was removed, but I don't know where it disposed.

I am still concerned about Building 4059. It might be a good idea to put in some wells around it and close to it and make sure there is no contaminated groundwater around that building because the reactor was in the basement and they had a 5-foot diameter tube that went from the reactor vessel to a huge diffusion pump packed in dry sand. The pump was used to prevent water from filling the cavity. The pump went bad and the cavity filled up with water. The water may have become radioactive at that time. It wasn't what I called dirty radiation, but the water and/or cavity probably became radioactive. That's the place I'm concerned with. If it's been cleaned up and a report has been written on it then fine. You would have to go down at least 40 feet to see if there was any groundwater contamination because the basement was 32 foot deep and this was below that. The Building 4059 radioactive water could have possibly drained down into Simi Valley and could be the reason people are saying there is some contamination down as far as Royal Street in Simi Valley. It might be worth looking into.

As far as hazardous chemicals, I handled acetone and some alcohol, but I don't know how they were disposed. It wasn't dumped on the ground, I know that, but I think there was some kind of container that they were put into and then disposed of properly. When I worked with hazardous chemicals they were handled reasonably well. I don't remember anything with hazardous chemicals occurring in a way that it wasn't supposed to. I am not aware of any spills of hazardous chemicals. Going back to Building 59, anything we used with radioactive

materials, like contaminated gloves, booties, or coveralls, was disposed of in separate containers, other than a wastepaper basket. It was handled differently. I am not aware of where it was ultimately taken or disposed.

When we were manufacturing fuel in Building 4005, there were two or three times we had to evacuate the building because some of the monitor alarms went off. In Building 4059 when we were getting that reactor core ready to go into the vessel we had to scram the building two or three times because alarms went off, but there was no contamination. Once we put the fuel in the container, one person could get within 2 feet of container, but if more than one person got in and around there, they say that the reactor would flash and it would set off the monitors. I don't know whether it ever did. I was in the building when we had to leave, but Health & Safety came in to check it out and clear the building. We were back in the building in 3 or 4 minutes. So, the radiation alarm went off, but I am not exactly sure why. There are a two ways the radiation alarm would have gone off. It could have been defective or it could have picked up radiation from a reactor flash. I know my film badges didn't pick up anything so it wasn't a flash on the reactor.

I'm sure there were company policies that dictated how we worked. The policy that irritated me the most was that they wouldn't let me drive my motorcycle between buildings with equipment strapped on the back. I used to ride a motorcycle to work and a lot of time we had transport equipment between buildings. People who drove their own cars to work were allowed to use their cars to transport equipment, but if I wanted to carry something on my motorcycle and drive between buildings, but they would stop me and make me walk. It was strictly a health and safety issue, you were not going to go up there and do anything that was going to put your life or limbs in jeopardy.

I'm sure that at one time there were rules or regulations that we had to read. I don't really remember that much about it. I think for the most part everyone did what they were supposed to and looked out for their safety and the safety of everybody else. We were pretty cautious up there. We all wanted to get off that hill alive and in good health. We had lead men and supervisors who oversaw our work and provided training. We had procedures that told us how we were expected to conduct our work. There were instructions and we pretty much followed them to the letter.

We kept quite a few log books and I also documented a lot of stuff with a camera. I took a lot of pictures for use in reports. Many of my pictures went back to Washington, D.C. for reports by other people. I had a color darkroom and had the capability of making a 16" x 20" color print. So I put out a lot of information that way. I believe my negatives all went down to the Atomics International DeSoto facility. There was a photo lab down there and I think all my negatives went there. I didn't ask to keep any of my photos. One print I wished I had that I was called in to take a photo of was a result of a test article in a sodium tank. We put a test article in a tank of sodium, pulled it out, cleaned it and wrapped it in plastic in the evening, unwrapped it the next morning, and immediately placed it back in the tank. We didn't check it again until it was pulled out four or five months later. A spider had gotten in there and created

a web on the baffles at the top of the unit. The sodium vapors created droplets on the spider web and I photographed it. That was a neat photo that I wish I still had. I had been called to take photos because a heater used to keep the sodium piping hot burned out. I went in and photographed that to show the extent of the damage. This all occurred in Building 4032.

There probably were things that went on that were not documented, but I can't think of anything. I am not personally aware of anything that was not documented. If there was something that happened at ETEC (also known as LMEC) I was out there with a camera to document it. We built big sodium pumps in Building 4463 and then transferred them into a pump case in Building 4462. I was out there shooting as many as 70 pictures while they were lifting that pump and transferring it over. I was continually shooting pictures.

The only liquids that I am aware of being disposed down a toilet were photochemicals from my darkroom. They were really not hazardous. I had my hands in those chemicals all the time.

Some tanks were removed from the outside of the Building 4024 years ago and I understand that the tanks were potentially holding radioactive gases at one time. The tanks were pulled out and everything around the tanks was removed. If it was contaminated it was hauled off. The tanks were located between Building 4024 and 4027, just outside and to the east of the Building 4024. The only reason I am aware of the Building 4024 tank is that at that time our department was headquartered at Building 4027 and they came in and took out the 4024 tank while we were nearby in 4027. I didn't know what Building 4024 was used for originally, although I think it was for a reactor that went out into space. It's still up there. They may have built that reactor in Building 4024 or there was also another reactor that was built up, but never had fuel placed in it, so that reactor could have been in Building 4024 as well, I'm not sure. So, there was the possibility of radioactive material in the basement pit of Building 4024, but I was never down there. Building 4019 also had a pit in it, but I don't know what was there. The pits were lined with reinforced cement.

The only disposal area I am aware of is the Sodium Burn Pit. I am not aware of any surface disposal areas at the western edge of Area IV or of any leach fields, septic tanks, or drainage discharge locations. I am familiar with the Old Conservation Yard. We got surrounded by wildfire in Simi Valley at one time and I came up to work after the fire had gone through the valley. I saw that the fire had come up the hill. It didn't do any damage at the edge of the hill, but it jumped to the salvage yard as the Old Conservation Yard was also known, and it got hot enough that it fused stainless steel piping together. It takes over 2,000 degrees Fahrenheit to fuse stainless steel together. There were also some lead acid batteries in there, glass cases that were melted down, and some puddles of aluminum.

I am aware of the following tanks at the Santa Susana Field Laboratory: Building 4059 had a liquid nitrogen tank. There was a big day use tank for diesel fuel between Building 4011 and SCTI (Buildings 4355 and 4356). There was a big tank farm in either area E, F, or G on the map. It contained a 1.5 million gallon tank for diesel fuel.

I remember one time we went down to Building 4356, where the steam generator was located in SCTI, and I was going down in the pit to do some inspection. I got down to the bottom grating and the whole bottom floor, about 10 feet down, was full of water. The sump pump had quit working. There was a steam generator down there. The other sump pump break down was in Building 4059. Those are the only issues I am aware of relating to sump pumps.

I feel as though everything was cleaned up at SRE. SRE as it was originally built is not there anymore. As I noted before, everything below the main building at SRE was removed. The building was jacked up, and everything was taken out and cleaned. Fill dirt was brought in and they put down a new foundation, filled it with cement and the building was used as a storage facility when I was there. I don't know where the fill dirt came from. I don't know if they had an area that they dug out up on the hill or if it was hauled on from some other location. I know it was clean fill dirt.

As far as specific radionuclide sources, we built uranium fuel rods in Building 4005 for an off-site reactor. The building was cleaned up completely and used for other tests afterward, but I wasn't involved then because I had moved to ETEC/LMEC. I had a cobalt source and an iridium source for x-raying only. The cobalt source was 100 curies of cobalt and the depleted pig that the cobalt was in weighed 500 pounds. It was transported on a unit with two large rubber tires and a dolly wheel. It would read about 20 mr (milliroentgens) at the outside of the case, but it was not contaminating anything. It could kill you if you received a big enough exposure.

I can't say that the Santa Susana Field Lab was a bad place to work. If it had been, I wouldn't have stayed that long. I enjoyed what I was doing. I was privileged in some ways because I did a lot of photography for reports and spent a lot of time in the large darkroom I had in Building 4027. Even though I was self-trained in color printing I managed to get it done. I think my specialty was helium leak testing for various areas. I was also an x-ray technician and we x-rayed welds of various things. I think the worst job I had was x-raying inside a gas-fired heater at SCTI. That was hard work. You had to go in and set up your equipment and your film, crawl out through a burner opening, run the iridium pill out, x-ray it, crawl back into the heater and make another set up to do it all over again. The worst of it was when I had to go underneath the heater and I'm a little claustrophobic. There was just room enough to squeeze through. It was a bit scary when thinking about what could happen if we had an earthquake and the unit collapsed.

I don't think it is necessary to re-evaluate SRE and spend a lot of time and money on it. The only thing I think might need to be done, and might already have been done, is put a test well down around Building 4059 and other than that I don't know of any problems up there. I don't have an ax to grind and am not trying to make trouble for anyone. I don't think it is necessary to go back and duplicate past clean-up efforts.

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I started at SSFL on January 23, 1962 as a senior engineer at the Shield Test Reactor. Later I worked at the SNAP Critical Facility. I travelled to other locations as part of my job, including the Idaho National Laboratory. There I worked on a reactor test in Test Area North called the SNAPTRAN-3 – we blew that reactor up on purpose. For AI, I managed work at several places in addition to SSFL. That was the only reactor we blew up on purpose.

I handled radioactive materials as part of my job. Mostly I handled fuel rods when we were putting them into reactors. They were clean and there was no concern about handling them. Generally, the reactors were supporting research. The experiments produced gamma rays and neutrons. We were testing how the reactor handled various situations and various shielding designs.

The fuel was generally stored at the facility where the reactor was located. If it was stored the way it was supposed to be, it posed no risks. We did things the way we were supposed to. Critical facility fuel was not radioactive, so we could handle it without any risk before, during, or after the testing. When fuel was removed from a reactor, it was stored temporarily in the same building, and then it was shipped out. Some went to Oak Ridge and some went to Idaho. Some of the SNAP cores are still at Oak Ridge. I know one guy did some work on some fuel that came from here; I saw that he used some of the calculations from my report in his work. He confirmed my calculations. They used some of our fuel in the Tower Shield Test Facility at Oak Ridge. Much of the fuel removed from the reactors here was not that radioactive. We would store the fuel in the water pools for a while, and then ship it somewhere else for reprocessing. We used fuel that was composed of a standard uranium-aluminum alloy.

In some cases, we decided what to do. No one had done it before, so we made up the rules and documented what we did. If there were paper pushers they could not tell us what to do because they did not know anything more than we did, probably much less. Today, it is more paper than work. But back then, we could figure out what was best without interference.

I think we had logbooks. I do not know what we did with them. You got me. There were retention rules. Five years or ten years. We kept them as long as we were supposed to.

I did not handle many chemical materials. We did have some hot gases, some transient fuel tests. We handled all sorts of stuff. Mostly when we were working with something that was potentially dangerous, we worked with it under a hood. We were not crazy. We did not do anything stupid. We didn't put ourselves in any kind of danger. We had plain water drains and we had contaminated liquid drains. We did not put anything but water down the water drains.

Some of this is hard to remember. That was a lot of years ago. Aside from the reactor tests, I cannot really distinguish between some things I did up on the hill and what I did down in Canoga Park. But we did not pour anything in the toilet in my day.

Nothing unusual or out of the ordinary happened on my watch.

We always wore film badges and sometimes we had pencil dosimeters. The film badges recorded what we were exposed to, but they did not tell us anything. They were checked later by the health physicists. The pencil dosimeters would show the level of radiation. All the buildings were alarmed. If we didn't hear the alarm, we knew that we did not have anything to worry about. The film badge just tells you what you were exposed to. The dose that you got was the dose that you got. You could not undo that.

Later, when I worked for General Electric up in Vallecitos, a guy dropped a bit of plutonium on the floor. He bent down and picked it up. He nearly turned purple he held his breath so long. We used to joke about how he turned purple from holding his breath. Nothing like that ever happened near me at SSFL.

We wanted to do things safely. We were about safety, in spades.

I went to school for nine years before I went to work up at SSFL. I did summer jobs under people who were outstanding in the field at Oak Ridge and at Brookhaven. I was well trained by good people. I learned good habits before I got here.

It has been said, if you can do something, you do it. If you cannot do it, you teach. If you cannot teach, you do quality assurance. There was not anything of consequence that wasn't documented. We might occasionally have something happen that had no health and safety consequence that we would not bother to record. The reactors were designed to shut down (or scram) if something went wrong. Sometimes they were over-sensitive, and shut down too easily. It was a hassle to start them back up again. There were safety interlocks designed into the facility – that's the purpose of the instrumentation,

Occasionally we would have power hiccups. Everything was designed to fail-safe. It was a pain in the neck, but it was designed to be that way.

At the MIT reactor, the controls on our subcritical facility attached to the reactor were on a relay such that if a shutter was opened too fast the relay would trip and shut us down. There was no safety risk, just unneeded instrumentation. In this case, the instrumentation was overly sensitive and hindered our ability to get our work done. In those circumstances, we would purposely put a matchbook cover between the contacts of the relay to prevent the automatic shutdown. This would allow us to operate and not shut down most of the time. This type of thing was probably not documented, but it was done. Back then, I would have no problem with this sort of thing because it helped me get my job done. There is no way you could do something like that today. You would have to go through a lot of paperwork to get rid of the useless relay.

I do not know anything about the sodium burn pit. I have heard that they shot barrels there. That was the way things were done. Sometimes it was important to let the pressure out of a

barrel, to expose the contents to air. It would have been dangerous for a worker to open a barrel. The safest and easiest way to puncture a barrel was to shoot it. That was done all over the country in those days.

I have heard there were places to dispose of things on site. I wasn't a cleanup guy. I was a reactor guy. I do not know where those disposal sites were. I know we ran a clean facility. I do not have any information on leach fields, septic tanks, drainage locations, sewer lines, storage tanks, and gas holdup tanks.

Most of what the community is worried about here is over-blown. I have no doubts that EPA will do a good job on the survey and that DOE will clean up whatever is found. I am confident of that. There have already been clean ups and my guess is that 90% of the contamination has already been cleaned up. The surveys will not find any smoking guns.

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I think most every site that I was involved with at Santa Susana Field Laboratory has probably already been cleaned up.

The first time I was on the hill was probably about 1956 on a visit. I started with Atomics International in 1954 at the Downey plant – actually it was called North American Aviation at the time.

I transferred up to the Liquid Metals Engineering Center in 1959. I was an engineer and I worked on the Kinetic Experiments for Water Boilers (KEWB). I designed a water boiler reactor. I had worked on a very similar reactor on a project in the 200 Area at Hanford before moving to California. The KEWB was underground. They eventually filled it in and put a cover on it. I assume it was cleaned up before it was filled in, although I have no knowledge that this was done.

I didn't have to wear a film badge in the beginning because we were just designing the facility. Film badges weren't necessary until the reactor went critical. The KEWB was the first reactor to go critical at SSFL, even before the Sodium Reactor Experiment. That was in about 1957. The SRE furnished power to the city of Moorpark for a little while. SRE was a lot bigger than the KEWB. I did not work on the SRE design.

I never handled any radioactive materials at SSFL. I handled radioactive materials at Hanford before I moved here, but I never handled any at SSFL.

KEWB was an experimental reactor. Once I had finished my job, contributing to the design of the reactor, I worked on other projects. My involvement was really only during design and construction. I wasn't involved once the reactors were operational.

I did work on other reactor designs, including two for Japan and one for Germany. I also worked on a small reactor for Denmark. I didn't go to any of those places. They shipped the reactor to Denmark after it had been constructed. Another engineer went to Denmark and supervised it until it went critical. I got my picture in Newsweek along with a Dane while I was working on the Danish facility. This was a similar reactor to the KEWB. They were built of metal parts, mostly steel parts.

They did have a lot of radioactive materials in the Hot Cell at LMEC – but I was not involved in that operation. I would visit once in a while, but I wasn't assigned there. The research done there was part of the Advanced Sodium Program, which was funded and monitored by Argonne National Laboratory.

I left the company in 1963. I went to work for AeroJet in Azusa, California. I supervised the radiation effects program. They had two reactors in Fort Worth, Texas. AeroJet eventually moved everyone to Sacramento. I still lived in Northridge, but I flew up to Sacramento on a

daily basis. The program manager was out of Cleveland. The company had four private jets. They were large and could carry 40 passengers.

In 1965, I went back to Rockwell and worked at Downey and Compton on the Apollo program. I was recruited by Rockwell to work on ground support equipment (GSE) for the Apollo program.

In about 1970, I went back to Hanford to work on the Fast Flux Test Facility. That was a $3 billion program. I was the systems manager, in charge of all of the sodium systems. Bechtel in S.F. designed that facility. We were the program managers. I was in charge of waste disposal, also. They built this facility out in the desert. The foundation was poured while we were still working on the design.

My first wife hated it there. We didn't want to live there. So, I went back to work for Atomics International at SSFL in 1972 and became involved in the sodium program. I worked directly for ILM. I was the program manager for the Advanced Sodium Components Test Program. A lot of my job was concerned with fiscal budgets. I was to make sure we spent money wisely. I took courses in nuclear technology on my own, not through the company. I was a degreed engineer at 20. My degree was from the University of Washington.

At ETEC, I was not involved in handling radioactive materials or chemical materials. I had an office at ETEC formerly LMEC, not far from where the SNAP work was being done. That was JMN's program. Eventually he left the company and started his own company.

Every job up there was different. One time I was working at the Small Components Test Laboratory and I was supposed to document all the piping in that building. It was three or four stories high. We needed to have a full inventory of all the piping so we could have accurate drawings. Things were getting changed all the time. One time I stopped at the end of a day and I marked the pipe that I was at with a piece of black ribbon. When I got there the next day, the entire pipe had been re-routed.

I was involved in responding to a letter from DOE or AEC, whatever it was called at the time. CF Braun had been doing a design construct for the Large Component Test Facility. They had been working on it for seven years. They claimed they were 85% done. DOE got fed up with them. They asked if we could help get the building finished. I ended up writing a 13-page letter for ILM that described how we could get that facility finished. They liked the letter. They fired CF Braun and put me in charge. I used about 12 engineers to help me. We got in there and realized they were only 30% complete. We ended up completing the project in only a few months.

Any way, we finished it up. I had to supervise the electrical work in addition, even though I am not an electrical engineer. I finished the electrical design in about a month, and then we built it. The LCTF was built to test large pumps that were to be used in the future fast breeder reactors.

I don't know anything about any liquids being disposed down drains or in toilets. The company was pretty careful. Things were pretty lax at Hanford, but not at SSFL. LMEC was pretty good. Everyone wanted to do a professional job.

We used bottled water the whole time I worked up there. The tap water was never drinkable. It wasn't contaminated, but it didn't taste good. It was hard water.
I never went to the Sodium Burn Pit. I saw a movie of them throwing sodium in it, but I never witnessed that myself. It was just a big hole in the ground that contained water. In the movie it sounded pretty loud. Pure sodium is an excellent heat transfer medium. It is non-corrosive in pure form, but very corrosive as sodium oxide.

I don't know anything about any leach fields. I don't really know anything about on-site drainage. I think we outsourced a lot of design for the waste management work.

I don't know much about the old conservation yard. I knew about it, but I didn't know where it was and I never went there. We may have gotten some materials from there for the KEWB, because we didn't have a lot of money when we were building that facility.

For the KEWB reactor, we had to order special state-of-the-art valves. They took 20 weeks before they were delivered. They came, and I told the contractor to take the internal seals out of the valves before welding them into place. He forgot to do that. The valves were ruined when he welded them into place. The valves leaked live a sieve. We would have to order them all over again. This incident would have set the project back 20 weeks. However, the contractor was able to get replacement valves in one week because he didn't have to go through the company process, which was inefficient.

The SSFL was one of the cleaner places I worked. It was above average.

I never knew very much about the SNAP program. That was JMN's area. I used to hear stories about some problems with that program. But in general, I think the SSFL was run pretty well. By contrast, I remember they used to say at Hanford, if you needed to dispose of radioactive material, just take it out and bury it. That was not how things were done at SSFL.

It's too bad there is so much fear about SSFL. The residential community grew up around the place. They didn't make the same kind of mistakes that were made at other sites. I remember one time at Hanford they wanted to build another chemical reprocessing facility. Everything would be done in it by remote controlled robots. There was one in 200 East and one in 200 West, and they wanted to build another. They pulled out the old drawings; they were in a big hurry. They poured a foundation, a 5-foot thick concrete foundation, and then decided they didn't want it after all. Then they just covered it up and cancelled it. I am not aware if the project was ever re-started.

Atomics International was run originally by the physicists, not by engineers. Physicists figure out the science, and engineers figure out how to get it done. It is great to work around the physicists.

I also worked for Lawrence Laboratory for about four years. I worked at both locations; in Livermore for one year and at Berkeley for three years. I worked there after I worked at Hanford and before I went back to SSFL. I helped set up Livermore Lab. I worked for Dr. Teller. It was exciting. One time I was in a meeting room with three Nobel Prize winners. I felt privileged.

I was working for IJL prior to the SRE core meltdown. He wanted to increase the power of the reactor. I told him I thought it was a bad idea. He wanted me to take over the project even though I did not want the job. They announced that I was taking over that program, and then the accident happened before I started. They took a lot of pictures of the damage down in the tank of the SRE. They gave the slides to me. IJL told them to give the pictures to me, so they did.

I don't think there was a cover-up at SRE because after the accident I was asked to give a talk at the last minute. I asked IJL if I could talk about the accident and use the slides I had been given and he said I could. I thought I was going to talk to 20 people for about 30 minutes. They gave me the address and I had just enough time to get there. I arranged the slides on the way and drove to the place where I was to give the talk. Three guys came out and met me. They said we've been waiting for you; you should start in about two or three minutes.

I went inside. It was an annual meeting the East Coast Utilities. There were 1,500-2,000 people in the audience! I talked for over four hours! I talked for two hours, then we took a break, and then I answered questions for two more hours. I showed all the slides. That's not what I would call a cover-up. No one was trying to hide anything, especially not Atomics International or DOE.

I told the audience what I thought. Everyone was interested; they stayed the whole time. I didn't hang onto those slides. I gave them back to the library which contained thousands of reports. Atomics International had a weekly newspaper and they had stories of what was being done all over the site. Atomics International and Rocketdyne had very little to with each other back then.

I left the company in 1981 and took an early retirement. Right after I left, Atomics International and Rocketdyne merged one company and Atomics International was a part of Rocketdyne.

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On July 16, 2010, I was interviewed in my home about my experience between 1958 and 1968 at the Sodium Reactor Experiment (SRE). This statement is based on my recollections.

From mid-1958 until mid-1968, I worked for Atomics International (AI) at SRE. SRE was located at AI's Nuclear Field Laboratory in the Santa Susana Mountains. During that time, I was employed successively as Senior Reactor Engineer, Senior Physicist, Experimental Supervisor, and Operations Supervisor. As an engineer, physicist, and the Experimental Supervisor, I planned, performed, and led the reactor physics work necessary to understand the performance of the SRE. As Operations Supervisor, I was responsible for operation of the reactor plant 24 hours per day, seven days per week. While I was a nonsupervisory employee, my immediate superior was LNO. As operations supervisor I reported first to GHJ, later to OQR, and finally to MOP. While I was Operations Supervisor, the Shift Supervisors and the maintenance foreman, NPQ, reported to me. Prior to joining AI, LNO had worked at the Hanford Engineer Works (HEW). After leaving SRE as Assistant Group Leader, OQR was promoted to Superintendent of the Hallam Nuclear Power Facility (HNPF) and later returned as Group Leader of SRE.

Prior to working at SRE, I was among 200 technical graduates hired by General Electric Company (GE) to work as Engineering Assistants at HEW. HEW produced weapons grade plutonium. During the 1940s and 50s, information related to the production of fissionable material was very highly classified, and no nuclear energy curriculum existed at any university. To prepare us to work in the nuclear field, GE trained us formally in their own Nuclear Training Program. While working at H Reactor, I received a 0.5 roentgen equivalent mammal (rem) dose of radiation during a refueling incident. Because of the training program, I understood the risk involved. The acute lethal dose is 500 rem (5 sieverts or 5 sv). After my exposure, I was required to submit collected urine for 24 hours and to stay out of radiation work zones for two weeks. Analysis of my urine indicated no ingestion radioactive material. My career dose is approximately 3 rem. Safety was paramount at HEW and at AI. Later, I would find safety paramount at Atomic Energy Commission (AEC) and Nuclear Energy Commission (NRC).

After leaving GE and before joining AI, I was commissioned in the United States Navy and served as an engineering duty officer. Most of my experience was in new ship construction in two commercial shipyards. All the work was nonnuclear. During the two years that I was stationed at Avondale Marine Ways, four workers died in the yard.

At the time I was hired by AI, I was qualified for the job based on my experience at HEW. I did however receive additional training at AI in supervision and management.

I left AI after AEC decided in September 1967 to retire SRE. By mid-1968, SRE staff had dwindled from 70 people to a chief operator, a reactor mechanic, and myself. Although AI offered employment to me in the Space Nuclear Auxiliary Program (SNAP), I elected instead to join the staff of AEC's regulatory arm that later became the Nuclear Regulatory Commission

(NRC). During my time at AEC/NRC, I visited many licensed commercial power plants but rarely entered a radiation field. However, on one occasion, at the Robinson 2 nuclear power plant, during a plant outage, I did enter a 5 rem per hour field in the end bell of one of the steam generators. The purpose of my entry was to increase my awareness of the work in progress and working conditions.

I am a Registered Nuclear Engineer in the State of California.

The SRE reactor was located beneath the floor of the high bay in Building 4143. All of the primary reactor cooling systems and part of the secondary cooling systems were also located beneath the floor. The reactor and cooling systems were in heavily shielded concrete vaults. The reactor vault was designed to be physically inaccessible to personnel entry. After decay of sodium-24 during plant outages, entry to the cooling vaults was safe and necessary for system maintenance.

Natural sodium is comprised of one isotope, sodium-23. In a reactor, sodium-23 absorbs neutrons to become sodium-24. This isotope is strongly radioactive, is a beta (electron) emitter and a gamma emitter, and has a15-hour half-life.

Storage cells for fuel and moderator elements and wash cells for fuel elements were also located below the high bay floor.

The high bay accommodated two overhead bridge cranes, one of large capacity and the other of lesser capacity for auxiliary work. The heavy-duty crane was capable of lifting the concrete shield blocks covering the cooling vaults and the reactor loading face shield. It was also used to position the heavy lead-shielded fuel and moderator handling machines. These were necessary to transport irradiated fuel and moderator elements from the reactor to storage.

In addition to the high bay, Building 4143 contained the reactor control room, electrical equipment rooms, a hot cell, health physics laboratory, and most of the SRE staff offices.

Power was piped via the main primary and secondary cooling systems to the steam generator. The steam generator was the interface between the secondary cooling system and the feedwater/steam system that served the electrical turbine generator. Southern California Edison (SCE) owned and operated the water system, the turbine generator, and power lines connecting the generator to SCE's electrical distribution grid.

The main and auxiliary primary and secondary cooling systems each had a motor driven, vertically oriented, centrifugal pump. Each pump had a shaft seal to prevent liquid sodium at temperatures up to 500° F from leaking out of the pump. Instead of using conventional seals, freeze seals were developed for this purpose. Tetralin cooling systems were designed and installed for the the freeze seals. They reduced the sodium temperature in the seal to less than 208° F, the melting point of sodium. Tetralin was selected because it is chemically similar to

kerosene and compatible with sodium. However, tetralin is an organic and decomposes pyrolytically at liquid sodium temperatures. Carbon is a decomposition product of that process.

Radioactive liquid and gaseous effluents were piped to storage tanks buried on the hill behind Building 4143. The tanks were covered with backfill.

Nearby were Buildings 4003, 4043, 4153, and 4163. The remaining SRE staff offices were in 4003. That building also provided space for nonradioactive test work. Building 4043 was used exclusively for warehousing nonradioactive spare parts for SRE. Building 4153, the Sodium Service Building, contained the secondary sodium storage tank and the sodium melt station. One end of Building 4163 was used for disassembly and maintenance of radioactive and non-radioactive SRE components and equipment. The remainder of the building was a machine shop that served the Nuclear Field Laboratory (NFL).

The fuel and moderator handling machines, when not in service, were parked in a bay off one end of the high bay. A carriage on the bridge crane was used to pick up the moderator-handling machine from its parking bay and move it onto the crane. A second carriage was needed to expedite movement of core moderator elements. An engineer on the SRE staff, OQR, discovered parts in the NFL Conservation Yard that could be used to inexpensively build a second carriage for the moderator-handling machine. I had informally approved OQR's request to proceed, but before we could do so, it was necessary for me to get approval from the Division Director.

The reactor core was an array of hexagonal logs of graphite moderator 11 inches across flats and 10 feet long arranged on end in the reactor vessel. Fuel elements were positioned in cooling channels on the axes of the moderator logs The fueled portion of rods was six feet long. All fuel rods and graphite logs were metal clad – the former to prevent fission products from entering the sodium coolant and the latter to prevent sodium from entering the graphite.

The SRE Group Leader was the senior manager at SRE. The supervisors of the operations, experimental, analytical, and modifications units reported to him. However, there were two small groups at SRE that were independent of the Group Leader. They were health physicists and hot cell operators. Health physicists were always at the reactor when it was operating or being maintained, and they reported to AI's health physics management. Their independence assured that operating objectives would not obscure safety considerations. Hot cell operators were there when they had work to do for SRE or other NFL clients.

Fuel elements for Core 1 each contained seven rods of uranium enriched to 2.778 atom percent uranium-235. Six of the rods were in a hexagonal array around the center rod.

There were 14 power runs with Core 1 separated by outages for maintenance and modifications and for operation at criticality (zero power) for testing. Power Run 1 started in July 1957 and design full power, 20 megawatts thermal (Mwt), was reached in June 1958. Power Run 14

ended in July 1959 after the fuel melting accident and subsequent diagnostic testing at criticality and low power.

During the last few power runs with Core 1, tetralin leaked into the primary coolant through the freeze seal on the main cooling pump. When SRE was taken to criticality for Power Run 14 enough carbon had deposited in the lower part of fuel cooling channels to seriously degrade fuel cooling. While attempting to take the reactor from criticality to full power, the operator lost control of the reactor. Power increased by approximately 50% in perhaps 100 seconds. The operator reacted by inserting the control rod to regain control. He recovered control at low power where the reactor performed normally. He then attempted to increase power again and again lost control. This time power increased more rapidly to about 14 Mwt. The operator pressed the scram button which dropped the safety rods into the core and simultaneously drove in all control rods.

The reactor became unstable because of voids in the sodium coolant caused by boiling of sodium in the fuel elements, which was caused in turn by carbon blockages in the fuel cooling channels, which was caused in turn by pyrolytic decomposition of tetralin during preceding power runs. Thirteen fuel elements were partially melted, and the cladding on several moderator elements failed. Fission products were released to the primary coolant and to the helium cover gas above sodium pool in the reactor vessel.

All Core 1 fuel and all damaged moderator elements were removed from the reactor. New replacement moderator elements were loaded in the reactor. New freeze seal cooling systems were installed on all the sodium cooling pumps. The coolant for the seals was sodium potassium eutectic alloy. The eutectic alloy is molten at room temperature and is compatible with sodium. SRE personnel were not evacuated from Building 4143 during the melting accident or at any other time except for one practice drill. The cost of recovery was 1.25 million 1959 dollars and required 15 months for repairs and modifications. New fuel would be loaded for Core 2 operation. PRS was operations supervisor during the Core 1 power runs.

At one point during cleanup after the accident, the Group Leader required all SRE personnel including supervisors and himself to participate for one shift in the physical decontamination of the high bay. Most horizontal surfaces were cleaned by mopping. Most vertical surfaces were cleaned by swabbing with Kotex® because of its absorbency. Operating and maintenance personnel continued the cleanup effort until Health Physics could release the high bay for unrestricted access by plant personnel. Health physicists used survey patches similar to gun cleaning patches to collect 100 square centimeter swipes of surfaces. Radiation counters were used to determine the amount of radioactive contamination collected on each swipe.

The fuel for Core 2 was thorium uranium alloy enriched to 7.1 weight percent uranium-235. The fuel elements were five-rod bundles surrounding a center unfueled support rod. Initial criticality with Core 2 was achieved in September 1960. Low-power physics tests were performed, and in January 1961 while increasing power for Power Run 15, the reactor performance was unstable. QST, Director of AI's Sodium Reactor Department, ordered shut

down of the reactor pending review by AI's Sodium Reactor Review Committee. The committee provided an advisory function while necessary testing was performed to identify the cause of the problem.

RTU and SUV used an analog computer obtained from Systron-Donner Corporation to model the performance of the reactor. In this way, they demonstrated that the power coefficient of reactivity was positive, in other words that reactor had fast positive feedback. This led to the theory that fuel rods were bowing away from the axis of the bundles and into higher neutron flux. Testing verified the theory. Each fuel bundle was restrained with a spiral wire wrap and positive feedback was eliminated. The spiral wrap was installed in the SRE hot cell.

Reactor operation was resumed, and in October 1963 during Power Run 41A, the SRE returned to full power for the first time since Power Run 13. During that interval, various other problems were addressed including core temperature oscillations, several ruptured moderator elements, and gas inleakage in the main primary cooling pump. These problems were corrected.

In February 1964, the reactor was shut down for the Power Expansion Program (PEP). PEP increased the power output capability from 20 Mwt to 30 Mwt. New moderator elements, control and safety rods, and sodium pumps were designed, fabricated, and installed in SRE. Core 3 fuel elements were received and stored in the high bay. PEP modifications were completed. The fuel was uranium carbide, a ceramic capable of operating at considerably higher temperature making possible the production of high quality steam for more efficient production of electrical power. The fuel was enriched to 6.5 weight percent uranium-235. However, the fuel was not loaded in the reactor. AEC refused to continue funding operation of SRE. Shift operations ceased in September 1967. AI-AEC-12572 (see Bibliography) presented seven plans considered by AEC for the future of SRE. It was initially retired, and sometime after mid-1958, it was demolished.

Sodium is a soft metal at room temperature. It melts at 210°F and boils at 1620°F. Its thermal capacity is one-third and its thermal conductivity is 10 times that of water. Because of its high boiling point and high thermal conductivity, it is an attractive heat transfer medium for nuclear power plants. However, sodium reacts violently in water, can ignite spontaneously in moist air, and, if ignited, burns in dry air. In high school and college chemistry laboratories, it is stored in kerosene.

Sodium was received at SRE in sealed 55-gallon drums and taken to the Sodium Service Building. Individual drums were connected to appropriate sodium piping. The drum was wrapped with electrical strip heaters and thermal insulation. Temperature was increased above the sodium melting point, and the sodium was transferred to the appropriate reactor cooling system.

Residual sodium from fuel elements was washed away by steam or water in the wash cells. The cells were needed to remove residual sodium from irradiated fuel elements prior to

shipment for reprocessing. TVW continued to do developmental work on the wash cell process after the reactor went on line.

Sodium pumps, valves, and intermediate heat exchangers were examined and repaired as necessary in Building 4163. The work there involved components from both radioactive and nonradioactive systems. The building was decontaminated as necessary so that personnel access was generally unrestricted.

On one occasion, a reactor mechanic, in violation administrative and maintenance procedures tried to clean a sodium valve with toilet bowl cleaner. Toilet bowl cleaner is acidic; sodium is an alkali metal. He immersed the valve in a bucket of the cleaner. The chemical reaction was immediate and violent. Fortunately, the mechanic was not injured, but did receive a three-day suspension without pay for his violations. A liquid stain on the ceiling of the building remained as a reminder of what had happened.

On another occasion, a sodium leak developed at the steam generator with the reactor at zero power and the cooling systems hot. The leakage was collected in a pan that, to the best of my recollection, contained calcium carbonate. Atmospheric humidity was very low, and a fire watch was maintained until the secondary cooling system could be drained to the sodium storage tank. Had a fire developed, AI's Fire Department would have responded.

Large canisters of Ansul®, a powder for fighting fires including sodium fires, were available in the high bay and elsewhere.

SRE used copious amounts of nitrogen in the vaults for the primary cooling systems and in the sodium service vault. This provided protection against combustion of high-temperature, radioactive, liquid sodium leakage. The gas was stored in liquid form in an outdoor storage tank adjacent to the high bay. Helium gas was stored in 2200 psig bottles manifolded together. Helium was used as the cover gas in the reactor vessel and the fuel and moderator handling machines.

The sodium burn pit was an outdoor facility located on Jackass Flat. It consisted of a small, relatively deep pool of water constructed of concrete surrounded by a concrete deck. The deck was at grade. At one end of the deck, was a single strong bulkhead with a few portholes in it. The portholes were glazed with high-strength glass. The bulkhead also had a hand hole to accommodate a hose nozzle. Debris, including scrap sodium system piping, bearing residual sodium-23 was washed with water from a fire hose. The reaction was violent, and the bulkhead provided protection for the operators. The reaction product was sodium hydroxide. When cleaned of residual sodium, the sodium hydroxide and debris were washed or pushed into the pool for later disposal.

After the AEC decided to decommission SRE, the primary sodium was shipped in drums to Hanford where the Fast Flux Test Facility, a sodium-cooled fast reactor would be built. The secondary sodium was shipped by rail in its storage tank to HNPF in eastern Nebraska. The

speed of the train was limited to 35 mph, and an experienced sodium systems engineer from AI's NFL accompanied the shipment.

Personnel at SRE were required to wear carry pocket dosimeters and wear film badges. The dosimeters were collected daily and reissued the next. The allowable daily dose and the range of the dosimeters was 50 mrem. The wearer could read the accumulated dose as necessary during the day. Film badges, as I recall, were collected weekly and were capable of recording a considerably higher dose. Health physicists were responsible for issuing, collecting, and processing dosimeters and film badges. In addition to these measures all persons exiting the site used the hand and foot counter in the lobby of Building 4143.

Health physicists were responsible for surveying the SRE and environs for radioactive contamination, roping off contaminated areas, and establishing portals with stepoff pads to prevent tracking of contamination into clean areas. Health physicists issued Special

Work Permits (SWPs) to operators, mechanics, and others to enter contaminated areas and/or radiation fields. The SWP specified the protective clothing required, breathing apparatus, and the time permitted in the protected area. In high radiation areas, a health physicist carrying a radiation meter capable of measuring low, intermediate, and high level fields always accompanied the work party. The health physicists reported to separate management and their orders were absolute. In addition to these duties, health physicists monitored effluents from SRE.

On one occasion, and only one occasion, was I aware of health physicists not neglecting their duties, but rather establishing the wrong priority. There had been an inadvertent spill of radioactive liquid on the asphalt surface outside Building 4143. The two health physicists on duty were decontaminating shoe soles of two truck drivers from offsite instead of determining the extent of radioactive contamination and roping off the area. This problem was promptly corrected.

On another occasion, an operator's dosimeter was reading higher than expected based on the fact that no high radiation fields or contaminated areas were known to exist in the high bay at the time. Surveying disclosed a fine collimated beam of radiation exiting from a slight gap between the concrete shield blocks above the vault for the primary cooling system. Packing the gap with lead sheet corrected the problem.

The SRE had two large liquid waste tanks buried in the earth a few hundred feet from Building 4143. The bottom surfaces of the tanks had severely corroded. The tanks were entered, decontaminated to the extent necessary, repaired and returned to service. To the best of my knowledge, this was done during the Power Expansion Program.

Solid and liquid waste from SRE was taken to the radioactive waste handling facility at NFL. It was managed by UWX.

I have no knowledge of toilets being used for disposal of chemicals or radioactive materials. I believe that the culture at AI in general and SRE in particular would not have tolerated such behavior.

AI had a training department that was responsible for the training and certification of Sodium Graphite Reactor (SGR), Organic Moderated Reactor (OMR), and SNAP reactor operators. SRE had an engineer, VXY, whose principal activity was assisting and cooperating with the training department in their work with SRE operators. VXY did much of the work in writing the SRE training manual and presented many of the classroom lectures. The classroom was located in Building 4143. Lectures covered layout, design, and operation of the various systems and the physical principles underlying their operation. On satisfactory completion of the training program, operators were granted certificates documenting their competence. All operators, chief operators, and shift supervisors held valid certificates.

The SRE training and operating manuals were, in my view, the two most important documents at SRE. The SRE Operations Manual was edited and maintained by WYZ of the SRE staff. It was an evolutionary document that depended on input from shift supervisors and other staff members for it technical content. The manual contained detailed procedures that identified vales, pipes, and other components by specific name or identification number.

During shift operations, a log was always maintained by shift supervisors to facilitate transfer of responsibility for the plant to the relieving crew. Management used the log books to stay abreast of plant operation and maintenance. The Group Leader, Supervisors, and Maintenance Foreman initialed the log after reading it. The Shift Supervisor on day shift prepared the Night Orders for the Operations Supervisor's approval. The Friday day shift supervisor prepared orders for the weekend. Holidays were covered in like manner. Each of the Unit Supervisors and the Maintenance Foreman prepared a weekly report of their unit's activities, and the reports were combined for documentation of the Group's activities. They also met as a group with Group Leader to discuss the week's activities.

For a time, we experienced thefts from SRE. Vacuum tube voltmeters, gloves, and gasoline were disappearing. To the best of my knowledge no radioactively contaminated tools or materials were removed from the site. We asked security to inspect cars leaving the site. Security did this on a random basis at the NFL gate. We believe that this stopped the thefts.

During my time at SRE there was no sodium fire at the facility. Furthermore, I am not aware of any sodium fire at SRE before or after my tenure. However, near the end of my tenure, a brush fire burned through the Rocketdyne Test Facility and AI's NFL. This occurred on a weekend. The AI and Rocketdyne Fire Departments fought the fire as did departments from local jurisdictions. To the best of my knowledge, the fire started in Box Canyon and off property controlled by Rocketdyne and AI.

SCE owned the redwood cooling tower which was necessary for operation of their turbine generator and hence was essential for distribution to SCE's grid of the power produced by SRE.

Although we believe that the automatic sprinklers designed to maintain the moisture content of the redwood functioned sometime in the preceding 24 hours, the cooling tower burned and was totally destroyed.

I spent some 19,000 hours of my life at SRE. I am now 82 years old, have four children, and six grandchildren. Neither I, nor my family, have suffered any ill effects from my employment.
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